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ARCHIVES OF OTOLARYNGOLOGY

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INFECTIONS OF THE MIDDLE EAR

ACUTE SYSTEMIC INFECTIONS FROM THE EAR*

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It has always seemed to me that of all the problems presented in the practice of medicine those concerning general invasions of the system are by far the most interesting. Discounting the bias that may naturally be ascribed to me, I believe that the problems of general invasions of otitic origin are second to none in interest. This subject has many ramifications; for a number of years I have been concerned chiefly with the practical side.

For a great deal of the data that I am presenting I must quote freely from Dr. Libman, who perhaps more than any other man in America has consistently contributed to the scientific aspect of this subject. I realize that perhaps this division with its attendant nomenclature may not be correct. I hope that it will not be offensive, but as it is obvious that the otologists bear the onus of this differentiation, I shall have to assume the burden.

I believe, with Libman, that it is essential at the outset to make use of an accurate terminology. "Otherwise one is very likely to make loose diagnoses and draw conclusions detrimental to the patient."

In the last few years the whole question of sepsis has been reopened, particularly from the practical point of view, in that transitory bacteremias have been found to be much more common and perhaps much less serious than was hitherto believed.

An invasion may be defined as the entrance of micro-organisms into the general circulation without any reference to the effect of this invasion on the patient. The term "invasion," then, according to Shwartzman, can be further subdivided into so-called (1) transitory bacteremia and (2) septicemia. While the concept expressed by the term septicemia might have been clear, it has unfortunately been so much abused and as a result is now so indefinite that it had better be eliminated and the term bacteremia substituted. Furthermore, the term bacteremia is capable of being paraphrased as, for example, strep-

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tococcemia, staphylococcemia and pneumococcemia, each one of which expresses a clearcut idea. A general invasion, then is a bacteremia. A general invasion of otitic origin is a bacteremia in which suppurative disease in or about the ear acts as the primary focus. In order to identify each of these types of invasions bacteriologically, the following criteria may be accepted:

Transitory bacteremias show the following characteristics: (*a*) the number of organisms found in a blood culture is small. This is judged by the fact that solid mediums usually remain sterile and growth appears only in the fluid mediums and then in most instances only in the well enriched fluid mediums. (*b*) The blood cultures do not remain repeatedly positive. In our experience with acute rheumatic fever, or ulcerative nonspecific colitis, one positive culture would be obtained out of four or five taken. (*c*) The type of organism usually found in transitory bacteremias, as shown by Libman and others, is *Streptococcus viridans* A and G (*nonhemolyticus*). The source of invasion in transitory bacteremias is most likely to be either the upper respiratory or the intestinal tract in which the aforementioned bacteria are found as normal inhabitants. There is experimental proof for this contention:

1. Bull and McKee recently reported experiments on rabbits in which they were able to obtain positive blood cultures shortly after depositing bacteria on the surface of the nasal mucous membrane. 2. Desonbry and Porcher demonstrated that bacteria of many varieties may pass through the intestinal mucosa during the digestion of fatty substances and are found for a few hours only in chyle and in the blood. These observations have been verified so often that it is now a rule in all institutes of serotherapy to bleed the horses only when they are fasting, if it is desired to obtain sterile serum. 3. Epstein and Kugel showed that blood cultures taken post mortem from patients dying of various noninfectious diseases are positive in a large number of instances. Since the micro-organisms found are usually enterococci (Hirsch-Libman streptococci), it is likely that the source of invasion is either the intestinal or the upper respiratory tract, in which these organisms are commonly present.

The mechanism of transitory bacteremias can be outlined as follows. Under certain debilitating conditions, bacteria enter the blood stream from the intestinal and respiratory tracts. The organisms which thus enter the blood are usually of low pathogenicity and incapable of doing serious injury. The blood has the power of ridding itself promptly of such organisms. The process of the prompt disappearance is not definitely known. In view of the fact that bactericidins in the true sense of the word do not exist for streptococci, it would be more logical to assume that the invading organisms behave in the general circulation as inert particles of colloidal substance and that the reticulo-endothelial system is responsible for their elimination from the blood. What is the

clinical significance of a positive blood culture with the characteristics described? One should be careful in accepting the results as indicating the etiology of the disease. In the individual case the clinical evidence must be carefully scrutinized and correlated with bacteriologic observations.

In contrast to the transitory bacteremias, the bacteremias in which we are particularly interested have the following characteristics: (*a*) In most instances, the number of bacteria found is large. This is demonstrated by the growth in the solid mediums and by the fact that all fluid mediums are usually positive. There are, of course, exceptions. (*b*) If the number of organisms found in the first blood culture is small, it is apt to increase progressively in subsequent cultures. (*c*) Blood cultures are repeatedly positive. (*d*) The organisms found belong to the actively pathogenic and virulent groups. It is evident that a bacteremia (nontransitory) is the result of an inflammatory process that is in free communication with the general circulation and that is aroused by virulent pathogenic organisms.

In order to use the bacteriologic observations advantageously for diagnosis, it is necessary to analyze them closely from the various points of view outlined.

While it is evident that otitic infections bear a close relationship chiefly to the second group of invasions, namely, the bacteremias (nontransitory), it might be in order to ask whether a suppurative otitis media can be a factor in so-called transitory bacteremia. From my experience—and I must admit that it is limited—it is my impression that as part of the upper respiratory tract and perhaps in conjunction with it an infection of the middle ear may be a factor in a transitory bacteremia. I have seen an instance of pneumococcus infection in the ear and mastoid, in which pneumococcus type I was cultured from the nasopharynx, and in which a transitory pneumococcemia began several days after operation. The lungs showed no change. A single blood culture, however, was positive. Operation was not performed on the sinus, and recovery was uneventful.

In 1912, Libman reported positive results from blood cultures in 80 per cent of cases of otitic invasion or sinus phlebitis. Perhaps because of changes in the mediums and other improvements in technic I have obtained positive blood cultures in nearly 90 per cent of cases, so that I cannot understand those who would minimize the value of blood cultures in suspected otitic bacteremias. In fact, I have been astonished at the utter disregard of this important diagnostic aid on the part of certain foreign colleagues.

It must be borne in mind that particularly in a general hospital cases of sinus thrombosis are received in all stages of their development. It is established that the thrombus formation is part of a reparative process. Yet the thrombus itself may become infected and subsequently

reinfect the blood stream. On the other hand, so long as the ends of the thrombus remain sterile and the area of phlebitis does not extend beyond them, the blood may remain sterile. Such a case may even be afebrile for a number of days. We have observed an instance of fluid pus in the lateral sinus with persistently sterile blood cultures.

In one hundred cases of otitic sinus thrombosis in which the history was studied and blood cultures made, the following data were obtained:

In eighty-five cases cultures showed streptococci, in two instances the anhemolytic variety. In three cases the streptococci could be grown only anaerobically. In one of the latter the preliminary blood culture showed an aerobic streptococcus. Following operation, the symptoms of sepsis continuing, it was found that subsequent aerobic cultures were sterile, but that streptococci could be obtained with the anaerobic technic. It is peculiar that these organisms should so rapidly have assumed the quality of anaerobiasis. It is particularly, however, in the presence of anaerobic streptococcus infection that the symptoms of sepsis evidence an excessively virulent nature. Two of the patients with anaerobic infections had abscesses of the lung, and one a large abscess of the temporal lobe. In only two of the one hundred cases studied was there a *Streptococcus mucosus* infection, a rather small proportion. Ten cases showed sterile cultures, two *Proteus* and one *Staphylococcus aureus*.

In no instance was a pneumococcus, except type III,[1] responsible for sinus phlebitis. In addition to the case already described, five cases of pneumococcemia were studied in the otological service during the period encompassed by these case reports. The first patient was admitted with a pneumococcus type I in the blood and spinal fluid, and he died on the day of admission. There was no postmortem examination. The second was admitted with a fulminating meningitis, with a pneumococcus type II in the blood and spinal fluid. No operation was performed. At postmortem examination no sinus phlebitis was found. The third was admitted with an acute mastoiditis with a temperature of 103.2 F. and a pneumococcus type IV in the blood. At the operation on the mastoid, the sinus was exposed and was found to be normal. Later pneumonia developed at the base of the right lung. Recovery was uneventful. In the fourth case, three weeks after operation for acute mastoiditis there was a chill and rise of temperature to 105 F., which persisted for forty-eight hours and then returned to normal. A blood culture taken during the chill showed a pneumococcemia. Subsequent blood cultures were sterile. The sinus was exposed and looked normal. The patient recovered. The fifth patient was admitted to my service during the past winter. She was a child aged 6, and had a temperature of 102.6 F. when admitted. Both ears

1. A bile-soluble Streptococcus mucosus, according to the old classification.

were discharging; there was no evidence of mastoiditis. She appeared gravely ill. A physical examination yielded otherwise negative results. On the night of her admission, the temperature rose precipitately to 105.2 F. A blood culture at this time showed a pneumococcus type IV. The culture from the ears yielded a pneumococcus type I. For several days following admission her temperature ranged between 102 and 104 F. The original roentgenogram of her chest was negative, but the second picture showed a pneumonic area at the base of the right lung. During the interval before the positive roentgen report the question as to whether we could be dealing with a bacteremia of otitic origin was discussed, and the possibility excluded on the basis of the pneumococcemia. I can only emphasize Libman's statement, namely: "It is essential that those who report such cases (i. e., sinus phlebitis due to pneumococci) give the exact description of the organism found and state their methods of identifying organisms in the pneumococcus streptococcus group." From my personal experience with cases of otitic bacteremia, either under my care or seen in consultation, I do not believe that the pneumococcus, except type III, is ever an etiologic factor. It seems to me that pneumococci show little tendency to attack the veins. Turning to the pathologic changes in the lungs in an attempt to confirm this opinion, Rabin stated that in pneumonia of pneumococcus origin there is rarely an involvement of the pulmonary veins. Occasionally late in the disease a leukocytic infiltration is found in the walls of the very small veins on microscopic examination. More rarely, the walls are invaded by bacteria. A constant bacteremia is not dependent on infection of the small veins alone. Lesions of the pulmonary vessels cannot be demonstrated as a cause for the invasion of the blood by the pneumococcus in the early stages of pneumonia. Thrombophlebitis of the macroscopic veins is the important cause of a persistent bacteremia. A case of pneumococcus origin of this character has not come under my observation. On the other hand, in streptococcus infection of the lung, phlebitis of the small veins is common. Occasionally the larger ones are involved and give rise to a general invasion.

Last winter I was asked to see a young man who had pneumonia. His illness began about ten days before with an acute infection of the upper respiratory tract and pain in both ears. During the first week and before the physical signs in the lungs developed, both ear drums had been incised, both mastoids operated on and one jugular vein tied. The blood culture was sterile. From a mouse which had received an injection of the sputum, a type IV pneumococcus was cultured. It seemed obvious to me, after such an experience, that it was important to discuss at length the rôle of the pneumococcus in general invasions of otitic origin.

It must not be supposed, of course, that in the presence of signs and symptoms definitely indicating a bacteremia, with a history of a

recent, or the presence of, a suppurative otitis media and no other focus one should be deterred from the proper surgical intervention because of a sterile blood culture. Yet the latter, if properly evaluated and correlated, is of great assistance in determining the immediate course of action.

Dr. Libman and I recently saw a young girl who had been operated on for acute mastoiditis. About a week following operation, a continuous irregularly septic temperature began, and leukocytosis and a rapidly progressive anemia were present. The hemoglobin dropped from 72 to 52 per cent. There were no physical signs in the chest and no metastases. Four blood cultures made both aerobically and anaerobically at intervals of about forty-eight hours were sterile. While we felt that in all probability she had an otitic sinus phlebitis, we advised against immediate intervention. Finally the physical signs of bronchopneumonia with pleurisy appeared. Recovery was complete without further operation.

There have been a number of reports of general invasions with the streptococcus in the presence of disease of the middle ear and mastoid in which there were neither macroscopic nor microscopic evidences of sinus phlebitis or thrombosis. So that, in contradistinction to the attitude of Libman, the belief that bacteremia of otitic origin may occur without the presence of changes in the sinus wall has gained ground.

The osteophlebitic theory of Körner is untenable. It seems probable that the cases of so-called otitic invasion without changes in the cranial blood sinuses, belong to the bacteremias of unknown origin and should not be classed as otitic. If a cryptogenetic invasion can occur in the presence of uninfected ears, it is patent that a similar condition may exist in the presence of disease of the middle ear and the ear not be the focus of infection. Instances of this type, however, must be rare.

The local pathologic changes in sinus phlebitis, that is, the changes in the walls of the veins, formation of the thrombus, etc., are now too well known to require any discussion. There are, however, several points with regard to the pathology of this condition which merit consideration. Fiendt and Blau, reporting separately about two hundred and fifty cases of sinus phlebitis, stated that pathologic changes in the bony plates overlying the lateral sinus were present in almost 80 per cent of the cases. In his monograph, Braun stated that in most cases of sinus thrombosis the inflammatory tract can be followed macroscopically from the middle ear to the thrombus. There is necrotic bone in the mastoid which leads directly to the sinus wall. While I believe that this applies generally to all the cranial sinuses in contact with the temporal bone, no matter which is involved primarily through otitic disease, there is nevertheless a considerable number of instances of sinus phlebitis in which at the mastoid operation or during the subsequent

uncovering of the sinus the bony plate over the latter gives no macroscopic evidence of disease, nor does the appearance of the vein wall itself always give information as to its contents. What the pathway of infection is in these cases is still problematic.

We have observed a considerable number of cases of general invasions of otitic origin in which the mastoid was sclerosed but macroscopically free from disease. In these there can be no doubt that the infection passed directly through preformed pathways, either vessels or dehiscences from the middle ear to the jugular bulb. In 1928, Maybaum reported a series of nine cases of primary thrombosis of the bulb from the otological service of the Mount Sinai Hospital. In three of these the mastoid process was pneumatic without gross evidence of infection. In the remaining six the mastoid was sclerosed and not diseased. In every instance the sinus plate was intact. In seven of the nine there was an obturating thrombosis in the sinus. One sinus contained fluid pus. In only one case could a thrombus not be demonstrated. Of the nine cases, eight gave positive blood cultures.

I shall not describe in detail the pathologic (metastatic) changes in remote parts affected by this disease. Schwartz has repeatedly demonstrated that live streptococci may be excreted in the urine in children without any clinical evidence of renal damage, and this condition may persist for some time until the blood becomes sterile. Indeed, streptococci may exist in structures probably less resistant to infections than the kidneys without clinical evidence of damage. I recently saw a patient with a streptococcemia due to a sinus thrombosis from whose spinal fluid streptococci were cultured. The spinal fluid showed 7 lymphocytes per cubic millimeter. There was no meningitis. The child recovered after operation on the lateral sinus and jugular vein. It is interesting to speculate as to the manner in which the blood stream is relieved of the infectious agent. I saw an instance of severe chill at night, when a blood culture showed colonies of streptococci too numerous to count, whereas twelve hours later a culture was sterile. This phenomenon was repeated three or four times. Instances of multiplication of bacteria in the blood in an invasion of otitic origin have not come under my observation. Comparatively little attention has been paid to the lungs as important organs the activities of which result in the sterilization of the blood. Physical signs in the lungs in cases of otitis bacteremia are frequent. From the analogy to experimental tuberculosis, there is considerable reason to believe that the lungs play an important rôle. In a rabbit given an intravenous injection of bovine tuberculosis, the lungs show the first evidence of the disease. Indeed, death may occur before the other organs are involved. If, on the other hand, an intraperitoneal injection is made, the mesenteric glands, the liver and the spleen show tuberculous lesions while the lungs

may remain intact until the last stage. The lungs, the liver and the spleen bear a similar relationship to the reticulo-endothelial system whose function it is to eliminate the organisms from the blood stream. In addition, each organ has its specific cells. It must not be forgotten that in bacteremias of otitic origin, the invasion through the venous channel passes from the heart primarily through the lungs. Perhaps a continuation and extension, along experimental lines, of the work on jugular cultures developed by Ottenberg will do much toward elucidating the question as to the activity of the lungs in this connection.

The occasional presence of abdominal pain without any physical signs as a symptom associated with bacteremias of otitic origin is suggestive from the clinical side that the organs here too are involved in some manner.

So far as the symptoms generally are concerned, they do not differ essentially from those of general invasions of other origins. It is true there are sometimes local manifestations, such as dilatation of the veins of the scalp and edema due to the extension of the phlebitis and thrombosis to the superficial veins through the emissary. Of importance, too, as a local sign is the enlargement of the gland at the angle of the jaw. It is my impression that involvement of a gland in this situation through an adjacent phlebitis differs considerably from the ordinary adenitis secondary to an acute infection of the upper respiratory tract. In the former the gland is firmer and, as a rule, much more tender. Occasionally there is pain or a feeling of fulness in the homolateral side of the head or pain in the eye. Indeed, the entire clinical picture may at the beginning closely resemble that of osteitis of the petrous pyramid with involvement of the fifth and sixth nerve. Occasionally the early symptoms of a sinus thrombosis resemble those of an abscess of the brain; there may even be physical signs suggestive of beginning involvement of the pyramidal tract. Fever, chills and sweats are common, although the chills occur in only half of the cases and infrequently in children. The fever is often at first sustained at a high level and only after several days do the characteristic drops in temperature and subsequent rises occur. Frequently the character of the temperature curve more than the height to which the fever rises suggests a general invasion. This is particularly true in aged and debilitated persons. The pulse is usually rapid and corresponds, at least in the beginning, with the temperature. As the disease progresses the pulse rate increases. An excessively rapid pulse rate is of unfavorable prognostic import. Enlargement of the spleen is common, and not infrequently both the spleen and the liver are palpable. The characteristic mental condition is euphoria, but the disease may begin with delirium or, having persisted for some time, may be associated with a psychosis or a wildly delirious state resembling the mental symptoms of bella-

donna poisoning. A rapidly progressive anemia follows the presence of hemolyzing organisms in the blood stream. As a rule there is a leukocytosis of moderate grade, not so marked as is usually found in erysipelas, pneumonia or meningitis. There may be a leukopenia.

Metastatic infections secondary to otitic bacteremias may occur anywhere in the body. It has seemed to me that they are more common in children than in adults. This has been so in our cases, and so far as the articular involvements are concerned the site of election in children has been the hip. I have not seen petechiae, particularly the white-centered lesions of the conjunctiva that occur with endocarditis. It is my belief that the latter lesions do not complicate infectious foci on the venous side of the circulation.

One other sign has been of considerable help: changes in the ocular fundus. About 16 per cent of the cases showed definite changes in the nerve head. In these I do not include congestion of the retinal vessels alone. The changes ranged from blurring of the margins of the disk to a measurable papilledema as high as from 4 to 5 diopters.

It is a curious phenomenon that when papilledema begins before operation it frequently increases after adequate surgical measures have been instituted which control the general invasion. It may increase in the absence of all other signs or symptoms and may last for several months. No satisfactory explanation has been offered, since the condition may exist and even increase with no other sign or symptom of increased intracranial pressure and finally progress to complete recovery.

I shall not give the details of treatment or discuss those points in the treatment which are still more or less unsettled. It suffices to state that treatment is solely surgical. Broadly it consists of an attempt to destroy the continuity of, and obliterate, the infected vessel. In this connection it must not be forgotten that a spontaneous cure of a phlebitis of the lateral sinus can, and not infrequently does, occur. I have had no evidence that would make me believe that transfusions of any character contribute, except indirectly, to the cure of the condition. They contribute no more than food or any other supportive measure does.

ANTROSCOPIC DIAGNOSIS OF MAXILLARY SINUSITIS *

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There is a modern method of diagnosis of disease within the maxillary sinus that seems to be used but limitedly and by comparatively few otolaryngologists at present. The principle of this type of diagnosis is being developed more and more in the various specialties, with considerable progress in the knowledge of pathology. This principle, consisting of direct vision through an instrument into cavities heretofore not seen, is young, and the method of putting an instrument, such as an antroscope, into the maxillary sinus for the diagnosis of disease is not new, but it is still in its infancy. Other specialties in which this means of making a diagnosis is used have made great strides forward in the recognition of particular pathologic processes in the special organs, because it is possible to see the process and it is not necessary to make a diagnosis by any of the other methods enumerated in the following paragraph.

The diagnosis of maxillary sinusitis depends on the following factors: (1) history, (2) physical examination, (3) transillumination, (4) puncture of the antrum or catheterization through the natural orifice with washing and (5) roentgenograms taken with or without the use of iodized oils.

The results claimed for these aforementioned procedures are summarized as follows:

1. In most cases the history is of definite aid in making a diagnosis of sinusitis. At times it may be so helpful and distinctive as to direct attention to the involvement of a particular sinus, but this occurs only occasionally, and frequently the history is indefinite. Usually, the data are only supportive and do not give specific indications.

2. Physical examination, which usually consists of inspection, palpation and pressure, is frequently helpful. Unfortunately, this corroborative evidence is often vague and uncertain. Also, it gives no indication as to the extent of the infection or of the condition within the sinus.

3. It is generally acceded that, at best, transillumination gives only corroborative evidence in some cases. Certain physicians hold that it is not even worth this much, while other think of it as a routine procedure and at times, a useful criterion.

4. Puncture of the antrum (or catheterization through the natural orifice), with washing out of the antrum after irrigation and thorough

* Submitted for publication, March 26, 1931.

removal of discharge from the nasal fossae and meatuses, is probably the most common method of diagnosis of maxillary sinusitis, and it is a fairly certain one. However, after washing out the antrum, one may still be uncertain of the diagnosis. The washing may show negative results, and yet from the history one may feel certain that there is a pathologic condition in the sinus. In fact, this occurs frequently, and constitutes an objection to washing as a means of diagnosis. Furthermore, the degree of the disease is difficult to determine from a washing; at least, the condition of the mucous lining of the antrum is unknown. In short, in making a diagnosis the use of puncture and washing has distinct value, but it also has shortcomings.

5. Lastly, the roentgen rays are of great help in the diagnosis of diseased sinuses and also in determining to some degree the extent of the infection. With the increasing use of various oils in making roentgenograms which are especially applicable to the maxillary sinus, correct diagnosis of the condition of the lining membrane is more certain. However, there are objections: (*a*) The roentgenograms mean increased expense to the patient. (*b*) The thickening of the mucous membrane lining the antrum occurs as a reaction to the opaque oil that is commonly used; such cases have been reported by Proetz. (*c*) The antrum must be punctured if the oil is injected. (*d*) Finally, the most important objection is that the extent of the involvement of the lining is uncertain; the film may show polyps from "filling defects" or a thickened membrane lining, but this method is never absolute proof of involvement, or indicative of the condition throughout the lining.

The measures described constitute the present armamentarium for the diagnosis of disease of the maxillary sinus. Except for transillumination, the methods are strikingly similar to those used previous to cystoscopy in the diagnosis of disease of the urinary bladder. With the development of the cystoscope, other procedures were practically given up, and cystoscopy became the method of choice for the diagnosis of conditions of the bladder. Visual inspection of the diseased mucous membrane is one of the most certain methods of diagnosis, and it supersedes all other indirect methods in determining the pathologic condition, and direct observation of the lining of the maxillary sinus should be the method of choice for diagnosis of its diseases.

In 1911, Holmes successfully developed the nasopharyngoscope from the small cystoscope for females. This instrument enables one to see the nasal fossae and the accessory regions, especially areas not in direct view under anterior rhinoscopy. Soon afterward, Dean, Yearsly, Skillern and others thought of examining the maxillary antrum with this instrument. The first attempts were performed in cases in which window resection had been performed, that is, cases in which drainage was instituted, or following Caldwell-Luc operations. Progress in this

method of diagnosis was slow, because it was realized that the procedure had technical difficulties.

In 1921, Baum [1] introduced a technic for examining the mucosa of the maxillary sinus with a nasopharyngoscope by a puncture made through the canine fossa. At the same time he reviewed the literature to ascertain the earliest work on examination of the antrum under direct vision. He wrote: "Introduction of the nasopharyngoscope without preliminary drainage operation and by the use of a trocar was first mentioned by Elenier von Tovolgyi in 1911, and in a careful search of the literature I have been unable to find any other reference to such a method." Baum's method of puncturing the canine fossa requires anesthesia of the gingivolabial fold and of the area surrounding the canine fossa. Puncture into the antrum at this point appears to be a valuable procedure for diagnosis in doubtful cases.

Later, Spielberg [2] reported several cases in which he examined the maxillary antrum with nasopharyngoscope after a puncture through the anterior portion of the inferior meatus similar to that made for washing out the sinus. He achieved fair success in these cases, but the blood from the pierced mucosa frequently soiled the distal object lens and obstructed the vision. Two months later,[3] he produced a special trocar and cannula for this nasopharyngoscope and called the instrument an antroscope. This instrument consists of a small nasopharyngoscope, a cannula and a trocar. The trocar is of the straight type, measuring 3.5 mm. in diameter, and the cannula, which fits closely over it, permits the antroscope to pass through and enter the antrum without touching the pierced mucosa, thus preventing the blood from covering the observing lens. Following this, Spielberg [4] reported other cases in which diagnoses made by other methods were doubtful and then were made correctly with the antroscope.

The next development in antroscopy was that made by Maltz,[5] who produced an instrument that he called a sinuscope. This instrument,

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1. Baum, H. L.: A New Method and a New Instrument for Endoscopic Examination of the Maxillary Antrum, Laryngoscope **31**:965 (Dec.) 1921.

2. Spielberg, W.: Antroscopy of the Maxillary Sinus, Laryngoscope **32**:441 (June) 1922; Contribution to the Diagnosis of Subacute and Chronic Inflammatory Lesions of the Mucosa, Lining the Maxillary of Highmore: Preliminary Report, ibid. **33**:203 (March) 1923; Diagnosis of Subacute and Chronic Inflammatory Lesions of the Mucosa Lining the Maxillary Antrum of Highmore, New York M. J. **116**:571 (Nov. 15) 1922.

3. Spielberg, W.: A New Method for Diagnosing Disease of the Mucous Lining of the Maxillary Antrum of Highmore. Technique—New Instrument, M. Times **50**:206 (Aug.) 1922.

4. Spielberg, W.: New Instrument for Puncturing and Visualizing the Maxillary Antrum of Highmore, Laryngoscope **33**:844 (Nov.) 1923.

5. Maltz, M.: New Instrument; Sinuscope, Laryngoscope **35**:305 (Oct.) 1925.

a German product, is even smaller than an antroscope, measuring only 2.6 mm. in diameter. Maltz stated that it has an excellent lens system called the Lupus optic, which permits observation of the mucosa even when the lens is in contact with the tissue, and at the same time permits vision of objects at a distance away. The present American instruments also permit this type of vision. Maltz also has a so-called prograde prism for his object lens in which the observing prism is tilted about 20 degrees forward, which allows one to see somewhat more forward than an upright prism will permit. However, one of the American manufacturers has a special instrument known as a sinuscope that permits direct vision ahead, and this gives a complete forward picture only. Maltz also has two associated instruments that are angulated at the distal end to permit examination of the frontal sinus. In addition, he developed "eye-piece" attachments of colored glass to show polyps and pus more clearly. He thinks that the first mentioned straight sinuscope is the most useful instrument, and that it can be used to examine the sphenoid sinus if the ostium is sufficiently large; if not, the ostium may be enlarged for this purpose. Maltz uses both the canine fossa and the inferior meatal route, though he prefers the former.

In January, 1928, Stout [6] modified the cannula of the antroscope by putting a collar on the distal end to prevent it from entering too far into the antrum.

The next development was an attempt to perform operations on the sinus with an antroscope, as is done in cystoscopy. The instrument used is described by Morse,[7] who mentioned that subsequent writings would follow. With this instrument, Morse can make topical applications and implant radium seeds in polypoid tissue. The latter procedure would certainly be a step forward in treatment, and would eliminate external operations for the removal of polyps.

Despite this development, one hears little of antroscopy or of the use of the antroscope as a method for making diagnosis in cases of disease of the maxillary sinus. The following facts seem apparent: 1. Frequently, washing of the antrum gives negative results when one is certain of the presence of disease. Cases often occur in which clinically the patient apparently has maxillary sinusitis, but pus is not found when the antrum is washed. The reason may be that the antrum has emptied itself, or there is no formation of pus, and hyperplastic and polypoid changes have given rise to the symptoms. However, if the lining of the sinus were visible, the presence of sinusitis could easily be ascertained. 2. Roentgenograms also have shortcomings in addition to the extra expense and time necessary. Ordinary roentgenograms taken without injection of iodized poppy seed oil 40 per cent or similar oil often show

6. Stout, P.: Antroscope, Laryngoscope **38**:48 (Jan.) 1928.

7. Morse, S.: An Operating and Visualizing Sinuscope, Arch. Otolaryng. **9**: 313 (March) 1929.

a congested membrane as marked clouding, while an antrum full of pus, or an antrum with polypoid changes may show even less clouding than that due to congestion of the lining. The use of opaque oils, which require puncture of the antrum, as in antroscopy, is helpful in many cases, but frequently one is in doubt as to the degree of the infection. The extent of the disease or infection is not determinable, even by this method, which is the latest and most discriminating of the diagnostic measures. One only estimates or gages as to whether one should perform an external maxillary operation, resort to window resection or use more conservative measures. The great advantage of an antroscopic view is that it gives a fairly definite idea as to the extent of the disease.

Considering the facts mentioned, it seems that antroscopy should be used as generally as cystoscopy, which has practically replaced all other methods for diagnosis of diseases of the bladder. Antroscopy should become the method of choice, especially since it has the additional advantage of permitting one to wash out the antrum, which is the treatment required in many cases, through the same puncture that is made for purposes of observation. Once the cannula is in place it is used to wash out the antrum, and through it the antroscope is passed by which one can see the lining membrane. One may observe the lining both before and after the washing. I have seen spots and strands of pus clinging to the antral wall following washing out of the antrum, which evidently does not remove all the pus, as is usually believed.

Antroscopy is not without objections, and one must consider them fully. 1. The technic as described subsequently requires somewhat more manipulation than ordinary puncture of the antrum. In fact, one should practice on the cadaver to make sure of the technic and to learn why the inside of the sinus is not always visible. 2. One cannot see the complete antrum with the present antroscope. Both of these difficulties can be remedied by a simple change, which permits a view of practically the whole lining, as in cystoscopy. 3. One must become accustomed to recognizing the changes in the mucous lining of the sinus, regardless of how well one knows the anatomy of the nose and the paranasal sinuses. This ability to recognize the changes will be acquired only by training and experience in seeing sinus mucosa, not from paranasal anatomy.

The technic of puncturing the antrum for antroscopic examination has been adequately described by Baum for the canine route and by Spielberg for the inferior meatal passage. Briefly, the procedure for passage through the inferior meatus consists in anesthetizing the anterior portion of the inferior meatus with local applications as in ordinary puncture of the antrum. Next, with the special trocar and cannula the antrum is punctured in the inferior meatus as far anteriorly as possible. Some otolaryngologists suggest that vision is improved when the opening is made in the lowest portion of the meatus; others in the

highest. It is not important at which site the opening is made; so far as vision is concerned, however, the highest portion is usually of thinner bone and is easier to puncture. The important point is to make the puncture as far anteriorly as possible, making an acute angle with the lateral nasal wall and not perpendicular to it. The reason for this becomes apparent when one examines the instrument and the puncture on the cadaver. Such an examination also explains why one may not even see the interior of the antrum or may obtain only a partial view of the walls. The space within the antrum is small and limited, while the distance from the distal tip of the instrument to the observing lens is more than 1 cm. This extra length prevents the antroscope from penetrating deeper into the sinus; that is, the observing lens, which is the "eye" of the instrument, may be just within the antrum or may not be within the antrum at all. The latter circumstance is rare; with an antrum of average size, it should never occur and in a small one, only rarely. The distance from the distal tip to the observing lens or prism should be lessened; this is a simple matter for an instrument maker. With the length cut down, a greater portion of the antrum will be visible.

No experience has been had with puncture through the canine fossa and those interested may refer to Baum's or Maltz' paper.

Efforts have been made to have a small camera attachment made to use in combination with the antroscope. This has already been done for the cystoscope and can be done with the antroscope, though the problem is slightly different. The problem is an ordinary matter of detail of development; none of the manufacturers of instruments who were written to are interested in the problem, since they anticipate an extremely limited demand, which indicates little or no profit. However, one does not need a photograph to make a diagnosis, as the determination of the mucosal condition is sufficient for diagnostic purposes.

SUMMARY

1. Punctures of the antrum with washings are sometimes helpful in making the diagnosis of maxillary sinusitis, but they frequently are useless; furthermore, they do not indicate the extent or type of the pathologic process present.

2. Roentgenograms taken with or without the injection of opaque oil into the antrum do not always give reliable evidence for diagnosis. Roentgenograms mean extra expense, and they can only help to gage the extent of the pathologic process; one cannot determine it with certainty.

3. Antroscopic examination is a simple procedure and permits the immediate determination of the condition of the lining mucosa by visual perception. I believe that it should become the method par excellence for diagnosis.

WHY LIGATE THE JUGULAR VEIN IN CASES OF LATERAL SINUS THROMBOSIS?*

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Any one who favors or advocates a procedure at variance with the one commonly practiced by the majority of his colleagues is faced with the necessity of giving the reasons for his faith. Consequently, when I make the statement that I believe operative intervention on the jugular vein in cases of lateral sinus thrombosis is superfluous, I should offer the data on which I base my opinion.

However, before offering my reasons, I might well ask: Why is jugular ligation so commonly practiced when one is dealing with an infection in the lateral sinus?

In the first place, there is the weight of authority and tradition. It will be agreed that when a pathologic condition is placed in the surgical class for the first time, the procedure advocated carries great weight; all who follow this procedure are supposed to be doing the proper thing, whereas he who advocates a departure is considered as practicing heresy. I might add that this applies with equal force to any custom.

So it was with the condition for which Zaufal, in 1880, first advocated ligation of the jugular vein and incision of the lateral sinus. Since that time ligation has been considered an essential phase of the operation on the lateral sinus, because by this procedure the operator blocked the main venous channel through which the septic material is being passed into the general circulation.

After a while, however, some operators questioned the necessity of the jugular work in all cases, and before long statistics were available giving the mortality rate of the cases in which the jugular vein was not ligated for comparison with the mortality rate of the cases in which the jugular vein was ligated, and it was noted that the results were just as good in the former as they were in the latter; in other words, ligation of the jugular vein was not a factor in the outcome.

The statistics most frequently quoted in this respect are those collected by Körner,[1] in which it is shown that the sinus was opened without ligation of the jugular vein in 132 cases, in 77, or 58.3 per cent, of

* Submitted for publication, April 24, 1931.

* Read before the Spokane Academy of Ophthalmology and Oto-Laryngology, May, 1930.

1. Körner, O.: Die eitrigen Erkrankungen des Schläfenbeins, Munich, J. F. Bergmann, 1899, p. 118.

which the patients were cured. The jugular vein was ligated before the sinus was opened in 94 cases, and in 56, or 59.6 per cent, cures obtained. The jugular vein was ligated after the sinus was opened in 69 cases, and in 38, or 55.9 per cent, the patients were cured.

Jones [2] analyzed the reports of 50 cases and did not discover a difference in the mortality rate between those in which ligation of the jugular vein was and in those in which it was not carried out.

Bezold was convinced that the favorable results do not depend so much on a certain method of operation as on early intervention; and in support of his contention, he quoted Toubert's [3] statistical compilation of 200 cases of lateral sinus thrombosis in which operation was performed. Toubert operated in 120 of the 200 cases within the first week after the appearance of endocrinal symptoms, with a mortality of only 25 per cent. In the other 80 cases, operation could be performed only after the first week, and in these there was a mortality of 62.5 per cent.

Krepuska [4] studied the necessity for jugular ligation in 295 cases of sinus thrombosis. In 196 of these cases, the patients recovered. Of those who recovered, 138 had not had surgical tying of the internal jugular vein.

In a report of 13 cases of sinus thrombosis, Hirsch [5] mentioned 9 patients who recovered, 4 of whom did not have ligation of the jugular vein; of the 4 who died, 3 underwent jugular ligation.

Gruenberg published reports of the cases that were observed in Wojatschek's clinic from 1917 to 1923. In 20 patients the jugular vein was tied; in 41 it was not tied. Of the first group 15 per cent were cured; of the latter, 60 per cent.

Kopetzky [6] wrote:

> I do feel that with a more thorough understanding of the value of the blood picture as an indication of the continuance or subsidence of the general infection, ligation of the internal jugular will not be done in all cases of sinus thrombosis as a routine procedure.

What experimental evidence can be offered for jugular ligation? Unditz contributed a paper on "The Influence of the Jugular Vein in Experimental Sinus Thrombosis" [7] in which he cited his experiments on the transverse sinus of the dog, in which he used staphylococcus, strep-

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2. Jones, C. C.: Ann. Otol., Rhin. & Laryng. **28**:1164, 1919.

3. Toubert: Arch. internat. de laryng., vol. 18, p. 437; quoted by Bezold: Text Book of Otolaryngology, translated by J. Holinger, p. 235.

4. Krepuska, G.: Ztschr. f. Laryng., Rhin. **17**:176, 1928.

5. Hirsch, Martin: Ztschr. f. Laryng., Rhin. **17**: 110, 1928.

6. Kopetzky, S. J.: Ann. Otol., Rhin. & Laryng. **37**:329, 1928.

7. Unditz, W.: The Influence of the Jugular Vein in Experimental Sinus Thrombosis, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:204 (Dec.) 1925.

tococcus and a mixture of the two forms. His results were as follows: Without ligation, five dogs died and six were cured; with ligation, the same results obtained. His conclusions are as follows:

1. Ligation of the main efferent vessels is not of noticeable influence on the course of experimental sinus thrombosis. The general condition also is not influenced.

2. Experimental sinus thrombosis in the dog has a decided tendency toward self cure. Only virulent cultures lead to death.

3. Thrombosis must be considered as a measure of protection in inflammatory processes of the sinus.

4. Ligation of the jugular vein is useless as a measure of closing the blood current because other channels remain open. The jugular vein should be tied only when the suppurative inflammation extends to the jugular vein itself or when the bulbus should also be drained from below.

5. After a healthy sinus wall has been uncovered and the focus of infection has been eliminated (the parts of the thrombus that are broken down), the portions that stick and the ends of the thrombi should not be disturbed.

If operation on the jugular vein is so essential in cases of lateral sinus thrombosis, why is it not just as essential in all cases in which the infected area drains into the vein? Or, putting it the other way round, when searching for reasons for not ligating the jugular vein in lateral sinus thrombosis, if this is not done in similar conditions, why should it be done in the one under discussion, particularly when statistics prove that the procedure has no influence on the mortality?

I refer to the work of Waldapfel[8] on posttonsillitis pyemia. He said: "Where abscesses could be completely drained, healing was obtained even without ligation of the jugular vein, and where the abscess could not be completely drained, the case terminated fatally even after eventual ligation or resection of the vein."

In reply to this statistical and experimental evidence of the futility of ligation of the jugular vein in influencing the outcome of lateral sinus infection, together with the reasoning from analogy, some might say that these reports are mere generalizations; that they prove only that ligation is not necessary in all cases, but that in special instances ligation is an essential part of the procedure. I shall consider in more detail the special conditions with which one is confronted, passing over briefly the conditions over which there is not much controversy and dwelling more at length on the features concerning which there is at present an honest difference of opinion.

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8. Waldapfel, R.: Post-Tonsillitis Pyemia, Tr. Am. Acad. Ophth. **33**:291, 1928.

Ballance said:

> Want of agreement among serious workers about a grave question of surgical treatment arises from the lumping together of clinical conditions having an essentially different pathologic basis, or from essential pathologic conditions not being clearly understood . . . All true and lasting surgical practice is based on pathology and when once pathology of an affection is clearly understood, divergence of view as to its treatment ought to disappear.

What, then, are the different pathologic conditions that may give rise to the clinical picture of infection of the otogenous blood stream?

First, I might mention the cases of hermorrhagic mastoiditis so well described by Kopetzky. In these cases, the thrombotic process starts in the veins of the mucosal lining of the mastoid cells and extends from these to the larger veins in the bony cell walls. The clinical course of these cases resembles very much the clinical course of cases of true infection of the lateral sinus, with the septic temperature, chills and even a positive blood culture of *Streptococcus hemolyticus,* 250 colonies to the plate. All that is necessary in these cases is a complete exenteration of the mastoid cells.

The second class of cases consists of those in which there is an infection of the outer sinus wall producing identical symptoms. In these cases, all that is necessary is the removal of the bony plate covering the sinus.

Lillie [9] reported nine cases of involvement of the blood stream, some with blood cultures positive for *Streptococcus hemolyticus,* in which removal of the sinus plate was sufficient.

Dixon [10] reported cases with rigors in which the patients recovered after removal of the bony sinus plate.

I had three cases last winter and two this year with the same history, and I know of two members of this society who have had a similar experience.

The third class of cases is comprised of those in which there is a real infection inside the lateral sinus with thrombus formation, and in which treatment consists in incision of the sinus, removal of the infected pus or thrombi and the establishment of free bleeding from either end. Again, this is all that is necessary. Kopetzky [6] and many others have favored this conservative procedure, but there are many investigators who think that ligation of the jugular vein should be a part of the procedure.

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9. Lillie, H. I.: Otitis Media and Disease of the Mastoid, J. A. M. A. **94:** 531 (Feb. 22) 1930.

10. Dixon, O. Jason: Departure in the Management of Infections of the Sigmoid Sinus, Arch. Otolaryng. **2:**453 (Nov.) 1925.

The fourth class of cases consists of those in which the infection has been removed from the region of the lateral sinus, but in which an obliterating thrombus prevents free bleeding from the region of the bulb.

While there are many investigators who might grant the wisdom of leaving the jugular vein alone in cases in which free bleeding was obtained from either end of the opened sinus, they insist that if free bleeding does not occur from the bulb, the internal jugular vein should be ligated. In 1920, I published a paper in which I accepted this view.[11] However, I now believe that ligation of the jugular vein is not necessary even in these cases.

This is the first real debatable ground, the conditions previously mentioned having many advocates for the conservative procedure of noninterference with the jugular vein. But in the condition in which free bleeding from the region of the bulb is not obtained, the majority of operators practice ligation of the jugular vein. Is there, then, any justification for not ligating the jugular vein in this condition? I believe that there is.

In the first place, thrombosis is a protective mechanism, which is Nature's method of preventing the spread of the infection. Kopetzky[12] said: "Thrombosis per se is regarded as a defensive mechanism, Nature's effort to circumscribe an infection entering the blood stream through the wall of a vein." Consequently, after the softened thrombotic débris and pus have been removed from the interior of the sinus and firm masses of thrombotic material occlude the region of the bulb in spite of ordinary measures to remove it, why should one be so alarmed?

Boyd[13] stated:

> Thrombosis, although an accompaniment of disease conditions, is nevertheless a protective mechanism. It buries to the best of its ability a clump of bacteria on a heart muscle under a mass of platelets, so forming a vegetation. It is true that at times the effects of thrombosis are unfortunate and undesirable, but such is only too often the case with the defense mechanism of the imperfect body with which we still have to put up.

He stated further:[14]

> The thrombosis tends to spread down into the internal jugular vein as well as to the other sinuses. The tendency, although disastrous in some ways, is yet beneficial in others, for the thrombotic process which occludes the vessels usually succeeds in keeping ahead of the liquefaction process which renders the clot so

11. Rott, O. M.: Ann. Otol., Rhin. & Laryng. **29**:820 (Dec.) 1920.

12. Kopetzky, S. J.: Acute and Chronic Otitis Media and Sinus Thrombosis, Arch. Otolaryng. **10**:302 (Sept.) 1929.

13. Boyd: Surgical Pathology, Philadelphia, W. B. Saunders Company, 1929, p. 141.

14. Boyd (footnote 13, p. 656).

dangerous, so that there may be a considerable area of liquefied clot in the vessel, a veritable abscess, which is nevertheless securely shut off from the general circulation.

If this is true, does it not seem logical to assume that once the liquefied mass has been let out of the sinus, the remaining firm clot will continue to remain firm, and the advancing infective process will stop? Is not that what happens even after free bleeding has been obtained and plugs are inserted behind which a clot forms? Otherwise what would happen when the plugs are removed? One firm clot is just as good as another.

One might say, "Yes, that particular area may not give any more trouble, but how do you know that the lining of the vein is not already diseased beond the opened area, just where the thrombus is now resting in the bulb or jugular vein?" In answer I can only refer to the work of Beck,[15] who has proved that no clot forms in the veins at the site of an endophlebitis.

In commenting on this article, Kopetzky [12] said:

> Usually one can remove the plugs with safety after from five to seven days. In an occasional case, however, clotting fails to take place in the vein for a much longer time. In my own cases this has presaged an unfavorable outcome. At operation, the surgeon has proceeded beyond the area macroscopically ascertainable as diseased, and has placed his plugs in the wall of the vein on what he believed was normal tissue. On removal of the plugs five or seven days later, the vein still bleeds and no obliterating clot has formed. Beck's experiment gives a reason for this.

This seems a sufficient reason for not fearing a firm clot left in the bulbar region.

Roberts [16] reported a case in which one sinus was completely thrombosed, and he was unable to obtain free bleeding from either end. No ligation was done. The patient had a mild septicemic temperature for one week without chills and then made a complete recovery.

The report of Day [17] of a spontaneous cure in six cases of unrecognized sinus thrombosis, which were accidentally discovered during operation, also corroborates these views on the beneficial and protective nature of thrombosis.

To individualize the cases further I might mention what Kopetzky [18] said of the beneficial effects of a thrombotic process occurring in the acute exacerbations of a chronic mastoiditis.

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15. Beck, O.: Acta oto-laryng. **12**:228, 1928.

16. Roberts, S. E., in discussion on Hastings, Hill: Bilateral Jugular Resection, Arch. Otolaryng. **4**:58 (July) 1926.

17. Day: Laryngoscope **25**:757, 1915.

18. Kopetzky, S. J.: Acute and Chronic Otitis Media and Sinus Thrombosis, Arch. Otolaryng. **8**:334 (Sept.) 1928.

All who are familiar with the pathogenesis of sinus thrombosis will realize that in persons with chronic mastoiditis, the wall of the sinus is gradually compressed once the inner table is eroded. In this way the blood stream is slowed and the channel is narrowed. When the intima is injured, a sterile thrombus forms and this is soon organized so as to obliterate the vein. This accounts for the frequent presence of an aseptic thrombus within the sinus at the radical operation for chronic purulent otitis. If this thrombus should become secondarily infected from an acute infection superimposed on the old chronic infection, fluid pus will be found in the sinus. The sinus, however, has been sealed off by the obliterating thrombus and rarely permits any bacteria to enter the general circulation. In addition, the preexisting tolerance to the chronic infection and the establishment of a protective thrombus before the advent of the acute infection, afford a prepared resistance to the new infection and consequently a better prognosis.

In regard to the persistence of the septicemia after the operation has been performed on the sinus and the occurrence of metastases, I realize that my continued belief in the futility of ligation of the jugular vein is unpopular, meaning that the majority of otologists believe otherwise. However, my belief is based on the following data and reasoning.

The entire question hinges on the larger question. Does ligation of the jugular vein prevent the absorption of toxins and bacteria from the focus of infection in the lateral sinus into the general circulation? I do not believe that it does.

The reason given for the advisability, if not the necessity, of ligating the internal jugular vein in cases of lateral sinus thrombosis is that thereby the chief avenue of absorption from the septic field to the general circulation is cut off. At first thought that might seem a logical and sufficient reason for the procedure, and before statistics were collected it seemed sufficient to demand its universal acceptance. However, when results with ligation were no more brilliant than those without, a weak spot in the reasoning was uncovered; namely, that unless all avenues of absorption are cut off, it is useless to cut off the chief avenue, because sufficient absorption occurs through other avenues to discount any advantage that might be obtained from cutting off the chief avenue. That this is true is proved by several results: (1) the statistics previously cited and (2) the successful establishment of collateral circulation even after both jugular veins have been ligated. In direct ratio to the success of the establishment of collateral circulation is the absorption into the general circulation not prevented by the ligation.

Unless all avenues are blocked, nothing is gained, because bacteria and toxins can cause just as great a disturbance when absorbed through a small vein as when absorbed through a large one. It is the old principle that a chain is no stronger than its weakest link. As an answer to this, some might say that they have had many cures following ligation that surely would have ended disastrously had ligation not been per-

formed. That statement, however, is not subject to proof, because who knows that the patients would not have been cured had ligation not been performed. Just because a cure followed ligation is no reason that ligation produced the cure, especially since just as many patients are cured without ligation.

Proponents for ligation might add that the septic symptoms continuing after the operation on the sinus quickly ceased after ligation of the jugular vein. Again that is fallacious reasoning, because septic symptoms continue after the operation on the sinus and gradually disappear without ligation, just as septic symptoms continue after ligation and eventually disappear. Whatever was done after ligation should in these cases receive the credit according to this reasoning. Rather, I should say, the cause of the disappearance was the same in the one as in the other, namely, the patient's powers of resistance.

Dixon [19] wrote: "Tying off the internal jugular does not stop the septicemia. It simply adds another hazard for a very sick patient. I have seen just as many patients continue their septicemia and wear out their infection with ligation of the internal jugular vein as without it."

A proof that ligation does not stop absorption into the general circulation is cited in two cases reported by Rosen,[20] in which bacteria appeared in the blood for the first time after ligation.

Another proof of the possibility of absorption of toxins and bacteria into the general circulation even after jugular ligation is furnished in the test which Ottenberg proposed for determining the side of a thrombosis. He found more colonies of bacteria in the blood from the normal side than from the thrombosed side, because the absorption directly through the diseased side is prevented by the obliteration of the jugular vein by a thrombus. What better proof could one ask of the inadequacy of ligation of the jugular vein to prevent absorption into the general circulation. The collaterals are too convenient,

Druss [21] also found 275 colonies to the plate from cultured blood of the vein on the opposite side and only 9 colonies from cultured blood on the same side.

To meet the objections of those who claim that all metastases and septic symptoms are caused by particles of infected thrombi that are broken off and carried directly into the circulation through the jugular vein of that side, I might quote from Kopetzky: [22]

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19. Dixon, O. Jason, in discussion on Hastings, Hill: Bilateral Jugular Resection, Arch. Otolaryng. **4**:58 (July) 1926.

20. Rosen, S.: Laryngoscope **35**:555 (July) 1925.

21. Druss, J.: Laryngoscope **37**:439 (June) 1927.

22. Kopetzky, S. J.: Acute and Chronic Suppurative Otitis Media, Including Acute Infection of the Blood Stream, Arch. Otolaryng. **2**:379 (Oct.) 1925.

It does not seem that the distribution of metastatic lesions depends on the character of the lesion in the mastoid, but rather on the type of organism presented and its inherent selectivity. *Pneumococcus* and *Streptococcus mucosus-capsulatus* invariably affect the endocranium after invading the mastoid. *Streptococcus hemolyticus* shows several strains, one selecting the joints and serous membranes, another the superficial structures such as the skin and muscles, while still another attacks the lungs. Metastases are not dependent on disorganization of the thrombus and the spread of its particles into the general circulation. The living bacteria themselves escape into the blood stream. These are much finer than any portions of broken down thrombi and can be carried everywhere that the blood reaches.

As the collateral circulation becomes established, therefore, the cause of the metastases is still operative, even though the jugular vein has been ligated.

Some might ask, "What about those cases of jugular ligation for metastases in which bacteria promptly disappeared from the blood and recovery ensued?" I would reply to this question with a quotation from Kopetzky:[22] "A metastasis may exist with no positive findings in the blood, for as is well known, it may act as a 'fixation abscess' which clears the blood stream. At any rate, it is recognized that artificially produced fixation abscesses in many instances have served to render blood sterile when it was positive before."

To me this proves that one cannot be too dogmatic when it comes to giving the reasons for a cure in any given case, especially when the cause of the cure might be the very condition (namely, the metastasis) that one is endeavoring to combat. Since the bacteria are the cause of the metastases, and since bacteria can still enter the general circulation in great numbers even after ligation of the jugular vein, ligation cannot be considered essential even in preventing metastases. At any rate, I think that there are sufficient data to warrant the belief that ligation of the jugular vein gets the credit for more cures than the facts warrant.

So it seems that some other cause for the difference in results must be sought. The virulence of the organisms, the resistance of the patient and the early removal of the focus of infection in the lateral sinus region include all the essentials.

In my mind, ligation of the jugular vein should be reserved for the purpose of removing a definite focus of infection in the vein itself, and then resection should be done as well.

As I said before, I think that in the matter of ligation of the jugular vein one is apt to attach to it an undue significance merely because of its time honored position in the various procedures advocated for the control of infection of the lateral sinuses. However, simply because a procedure has been carried on for years is no reason why subsequent data may not cause it to be discarded. Unceasing change is a universal law, and I think that the time will come when the procedure of ligation

of the jugular vein will not be so universally practiced as it is today, just as today it is not practiced so universally at it was twenty years ago.

The change will come slowly, because just now, especially when septic symptoms continue after operation on the sinus, one is afraid not to ligate. After ligation one has a feeling of security in knowing that all that has been advocated has been done, even though death supervenes, whereas if ligation is not performed, one has to face the criticisms of colleagues who might think differently about the method of procedure adopted. However, if those who do not believe it best to ligate have the courage of their convictions and operate on the sinus early, bolstering up the resistance of the patient by all the means at their disposal, including frequent transfusions of blood, and if they fight just a little bit harder to justify their belief, I think that the mortality rate will not be higher when ligation is not performed than when it is.

CONCLUSIONS

My conclusions are:

1. The only indication to be met in the treatment for lateral sinus infection is the prompt removal of the infected area, whether that area is in the mastoid cells, the sinus plate, the wall of the sinus or inside the lumen of the sinus.

2. Ligation of the jugular vein does not prevent absorption of toxins and bacteria into the general circulation and hence is a superfluous procedure.

3. Ligation of the jugular vein should be reserved for definite infection in the vein, and then should be accompanied by resection.

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A METHOD OF MEASUREMENT OF TINNITUS AURIUM *

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The field of aural tinnitus has escaped extensive scientific study primarily because no method of objectively studying this subjective symptom has been available. This paper is a preliminary report of a method that I have developed for the measurement of the pitches and intensities of tinnitus, and of some of the findings.

The point of departure in this study was the observation that when a sound of the same fundamental pitch as the tinnitus is superimposed on the ear, a masking of the superimposed note by the tinnitus is found, instead of a summation of intensities; one would not expect this result if the mechanism of tinnitus and of hearing of sound from the outer world were similar. In a fairly large series of cases it was found that the intensity of the superimposed sound required for hearing of the sound, above the normal threshold for that frequency, constitutes a fairly reliable measure of the intensity of the tinnitus.

The instruments required for the study of tinnitus are the following: (1) a beat-frequency oscillator of continuous range with an appropriate attenuator, and an amplifier; (2) a vacuum tube voltameter or an indicator of power level.

The fundamental pitch of the tinnitus is first determined by stimulation with adequate intensity over the full range of frequencies. The threshold of the determined pitch overcoming the masking effect of the tinnitus is then determined and compared with the normal threshold of that frequency. The result is the level of the tinnitus.

The frequency of the tinnitus is generally at the pitch, or pitches, where the auditory curve drops off sharply. In moderately advanced cases of progressive deafness, high-pitched tinnitus has been found most often between the frequencies of 2,500 and 4,000 double vibrations. Low-pitched tinnitus occurred most often in the frequency range of from 40 to 200 double vibrations, and was most frequently found to be annoying in cases of deafening associated with cardiac insufficiency and anemia.

When the intensity of the superimposed sound is raised to a sufficiently high level, the tinnitus can be drowned out, and there remains in the ear a rumble that is synchronous with the pulse. This effect, the drowning out of the tinnitus, can be accomplished also by superimposing

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the pitch of the tinnitus in sufficient intensity by way of the opposite ear, in which event the patient has the sensation of a "drawing" across the occiput. By still further increasing the intensity of the note, the throbbing rumble, synchronous with the pulse, can also be drowned out, and in this event it is found that both rumble and tinnitus are lost for a variable period of time after stimulation has ceased.

The pitch of the tinnitus has been found to be shifted by the same factors and therapy that effect similar shifts in the level and curve of hearing—vascular changes, barometric and climatic changes, galvanization, auditory fatigue, etc. Pressure on the carotid arteries results in a transient intensification of the tinnitus after the pressure is released. Relief from low pitched tinnitus was obtained with some regularity, especially in the following types of cases: spasm of the auditory accommodative mechanism, by relief of the spasm; cardiac insufficiency, by digitalization; anemia, by appropriate medical therapy. In a lesser proportion of the cases, relief from high pitched tinnitus was obtained. The rumble, which is especially annoying in the arteriosclerotic and hypertensive cases, also responds to therapy.

The turmoil type of tinnitus has been found with greatest frequency in cases that present evidence of organic cerebral lesions or increased intracranial pressure; in cases presenting this type of tinnitus, it should be suspected that the deafness is but a symptom of a cerebral lesion, an occurrence which is far more frequent than is generally suspected.

Accumulating data bid fair to throw much light on the mechanism of stimulation of the auditory nerve and of hearing. The indications are that the sensitivity of the auditory nerve endings is dependent on their vascularization, in much the same manner as is the sensitivity of the retina, as I have recently demonstrated with photographic proof. It should be noted that Wever and Bray have, in the course of their masterly work on auditory nerve conduction, demonstrated the dependence of auditory nerve response on the vascularity of the nerve. They found a fairly prompt loss of nerve response when the circulation was cut off by clamping the artery, with a restoration of response when the clamp was released (personal communication). Thus, the hypothesis advanced by Gray, myself and others, that the pathologic process in many cases of progressive deafness is fundamentally vascular, has been subjected to some measure of experimental proof, in addition to the clinical proof that we have advanced.

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LIPOMA OF THE LARYNX*

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There is probably no more confusing lesion of the larynx than lipoma. It rarely occurs, and when present is difficult to diagnose. In a thorough survey of the literature, Gordon New [1] was able to find only twenty-three reported cases, exclusive of the one that he presented in 1916. In 1909, Goldstein [2] also reported one unusual case of multiple lipomas of the larynx, which he removed through the mouth by the use of a cold wire snare and curved scissors. He also reviewed in detail the complete clinical course of twelve cases of lipoma of the larynx that had been reported up to that time. Practically every one of the patients presented themselves on account of difficulty in breathing and choking when fluids were taken.

The most striking case was that of a pendulous lipoma reported by Holt,[3] which almost entirely closed the pharynx and was swallowed into the esophagus. It was attached by fibrous tissue to the left side of the epiglottis and connected with the upper part of the pharynx, larynx and esophagus; it measured 9 inches (22.8 cm) in length. The tumor occasionally protruded from the mouth, and, except for the fact that the attachment pulled the larynx open and caused the patient to choke on fluids, he did not experience difficulty. It was surmised, however, that the tumor got into the trachea, instead of the esophagus, and suffocated the patient, as he was found dead in his chair, where he had been smoking.

In 1922, Beck [4] reported a lipoma of the laryngopharynx which he removed from a boy 16 years of age. At first, only a biopsy was performed. Then radium therapy was tried, and, as Beck stated, this only proved the known fact that radium has no effect on lipomas. One year later the patient returned on account of obstructive symptoms. The growth was removed by suspension laryngoscopy with sharp dissection.

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1. New, Gordon B.: Fibrolipoma of the Larynx, J. A. M. A. **66**:566 (Feb. 19) 1916.

2. Goldstein, M. A.: Lipoma of the Larynx, Laryngoscope **19**:641, 1909.

3. Holt, quoted from New, Gordon B.: Fatty Pendulous Tumor of Pharynx and Larynx, Tr. Path. Soc. London **5**:123, 1854.

4. Beck, J. C.: Lipoma of the Laryngopharynx, Ann. Otol. **31**:1139, 1922.

At the same meeting (Chicago Laryngological and Otological Society), Robertson [5] reported the case of a patient with obstructive laryngeal symptoms, who had multiple lipomas over the body and one in the buccal cavity. A mass in the right side of the larynx was diagnosed as a lipoma, but during a preliminary tracheotomy the patient died. At necropsy, the laryngeal and buccal growths were found to be true carcinomas, although the other tumors on the body were lipomas.

It is not difficult to understand why this lesion is hard to recognize, when one stops to consider the gradual onset, the absence of pain, fever and bleeding and the slow development of obstructive symptoms.

We have found only one record of a case in which the lipoma originated in the aryepiglottic fold without a demonstrable pedicle; this case was reported by New.[1]

REPORT OF A CASE

History.—Miss B., a school teacher, aged 44, was admitted to St. Luke's Hospital on April 5, 1927, on account of difficult and noisy breathing. She stated that she had first noticed hoarseness several years previously. This was followed several months later by difficult breat[illegible], and her relatives told her that she snored loudly when asleep. There had never been pain. She choked occasionally when taking fluids rapidly, and she had a bra[illegible]sy type of cough. All of these symptoms had become progressively worse.

In addition to the laryngeal disturbances, the patient was greatly crippled by a severe form of arthritis deformans (fig. 1). Since this condition involved practically every joint in the body, at first we were inclined to believe that she also had arthritis of the larynx which was causing the obstructive symptoms.

Operation.—Indirect laryngeal examination revealed a smooth, pale, domelike tumor protruding above the left cord from the aryepiglottic fold. Anticipating that this was a malignant neoplasm, on Jan. 10, 1928, a local thyrotomy was done with the patient under local anesthesia; part of the tumor was removed, and a biopsy was performed (fig. 2). There was, however, such extensive involvement that no attempt was made to remove the entire tumor at this time, as it was thought to be malignant, and a total laryngectomy was planned. Much to our surprise, when the tissue was examined the tumor was found to be a lipoma (fig. 3.).

Recovery from the thyrotomy was eventful. The patient continued to snore, but there was less dyspnea. Gradually, however, as the lipoma continued to grow, the obstructive symptoms returned, and three months later the left third of the entire aryepiglottic fold, which was the base of the lipoma, was removed with sharp dissection (fig. 4). The vocal cords were not disturbed. This operation was performed with the patient under local anesthesia, and the wound was tightly sutured.

Postoperative Course.—The night following the second operation the patient had so much dyspnea that the intern was obliged to insert a tracheotomy tube. She wore this tube for about ten days, and when it was removed, the fistula closed

5. Robertson, C. M.: Neoplasms of Larynx, Illinois M. J. **43**:210, 1923.

Fig. 1.—Photograph taken eighteen months after the removal of the laryngeal lipoma by local thyrotomy. The wound of the neck has completely healed. The hands show the marked arthritis deformans which involved nearly all the joints in the body.

Fig. 2.—Drawing made prior to the first operation, showing the domelike protruding tumor from the aryepiglottic fold. The tumor actually extended forward and involved more of the epiglottis than the artist has shown.

without suturing (fig. 5). The postoperative reaction was extremely mild. She had no cough, little mucus and so little difficulty in swallowing that it was not necessary to feed her by tube.

Pathologic Observations.—The tissue removed at the first operation measured 27 by 13 by 10 mm. It was partially covered with pale mucous membrane and showed peripheral desiccation from the cautery. On cross-section, the surface

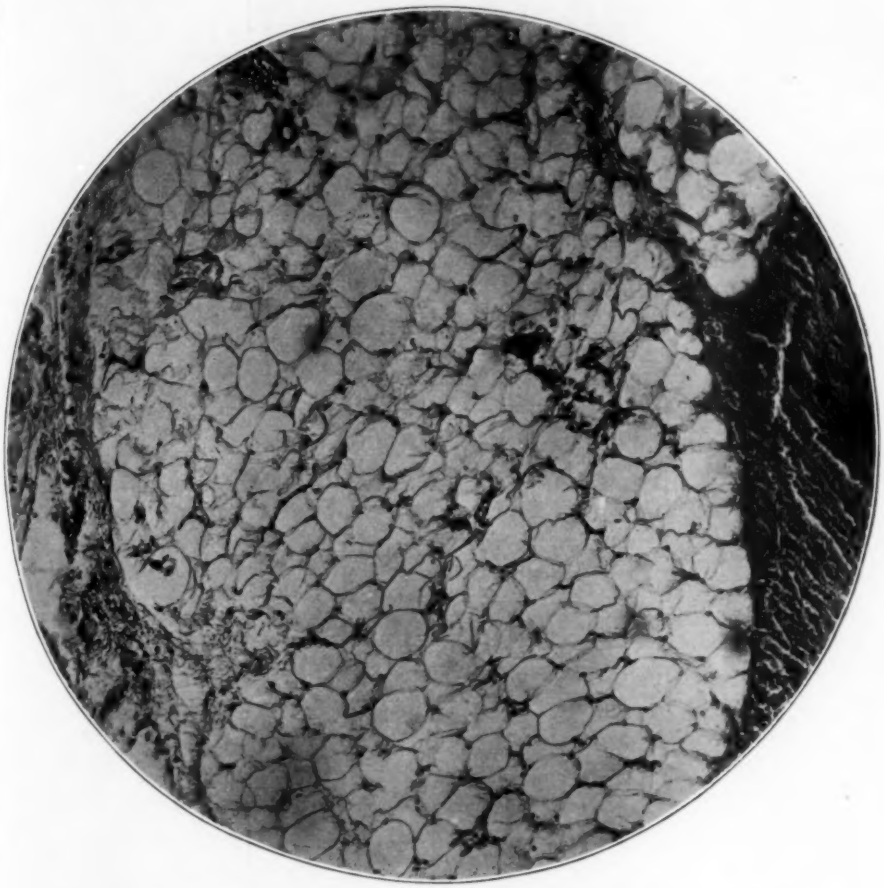

Fig. 3.—Photomicrograph of the lipoma, showing typical fat cells and a layer of necrotic purulent exudate on the surface; × 125.

was greasy, semilobulated and yellowish white. Microscopic examination showed that the major portion of the tissue was made up of adult fat cells, with here and there some small, rather young, lipoid-containing cells in the surrounding, loose, connective tissue stroma. Ulceration was present on the surface, which was covered with necrobiotic pus cells and necrotic débris. At the base of the section, an extremely edematous connective tissue containing mucous glands and infiltrated with mononuclear leukocytes was found.

On gross inspection, two pieces of tissue removed at the second operation, which were of almost the same size as that taken at the first operation, showed characteristics similar to those of the first piece removed, with the exception that they were much denser in consistency. Histologic examination revealed

Fig. 4.—Drawing made as the tumor was being removed. The vocal cord was not removed, but it is not shown.

Fig. 5.—The wound after the lipoma and the involved area of the epiglottis were removed. The true cords were not disturbed.

much more edematous connective tissue than was present in the first section. Otherwise, the pieces were almost identical with the previous material removed.

Whether this was a true neoplasm of the fat tissue or an extensive interstitial lipomatosis is subject to question. We are inclined to feel that this remarkable sub-

mucous, laryngeal accumulation of fat tissue was deposited there as a result of a low grade, chronic inflammatory reaction, since a true capsule was not present, and there was a moderate increase of fibrous tissue, showing considerable infiltration of round cells.

ETIOLOGY

Goldstein [2] stated that the etiology of lipoma is questionable, and that it may be due to three causes: (1) a simple hyperplasia of encapsulated fat cells, which Chiari observed microscopically about the plane of the ventricle; (2) an invagination of mesodermic tissue which develops into a lipoma, and (3) a disturbance in the chemistry of the cells in which fat is deposited.

In expanding the third theory, a brief observation and possible explanation might be added. It seems to us that this condition represents an infiltration of fat tissue of the submucous laryngeal stroma following a chronic inflammatory reaction. As this patient was suffering from multiple arthritis, Dr. Dixon, when inspecting the larynx, made the observation that the condition might be due to a similar reaction taking place in the larynx. The subsequent slow development of a tumor, however, was somewhat misleading. In view of the observations at biopsy, we are inclined to view the surprising accumulation of lipoid tissue as an infiltration of fat tissue in an old, chronically inflamed stroma. It is a well known fact that following chronic inflammatory reactions of this type a rather striking lipomatosis is sometimes seen. We have frequently encountered it in the pleura, where it has been deposited in the thick, old, fibrous pleural adhesions, and, on several occasions, we have seen it in the capsule and at the base of sclerotic, chronically inflamed tonsils.

According to New,[1] the incidence in lipoma is not related to age. The tumors have been observed in patients ranging in age from 8 to 80 years. In 1905, Ingalls reported a case in a boy 8 years of age, and as early as 1854, Holt reported one in a man of 80. De Santi reported a similar case in 1903. The most frequent point of origin is the epiglottis, the aryepiglottic fold or the ventricle. The attachment is usually by a thin pedicle or, as in our case, by a thick heavy base. In New's article, he said that in 1907, Hunt had a patient with a lipoma attached to the first three rings of the trachea. The tumor was removed by tracheotomy.

COMMENT

In spite of the fact that the management of the case reported reperesented a series of mistakes, all of which were brought about by the failure to recognize the type of lesion prior to the time of the first operation, the patient has been well for more than three years. with only a slight huskiness of the voice and without any respiratory

disturbance. Had a complete laryngectomy been done, it would have ended in a tragedy. The unusual finding of a lipoma suggests the importance of biopsy in all laryngeal conditions suspected to be malignant.

SUMMARY

1. A case of lipoma of the larynx is reported in a woman, aged 44, who had multiple arthritis.

2. The etiology of the growth may have been a lipomatosis secondary to a chronic inflammation of the larynx.

3. Prior to the first operation, the lesion was considered a malignant growth, and a total laryngectomy was planned.

4. Thyrotomy performed under local anesthesia was a satisfactory method of approach.

THE BLOOD PICTURE IN OTITIC INFECTIONS*

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This study was undertaken with a view to determine the value of the blood picture in various types of otogenic conditions, both infectious and noninfectious. The otologist does not ordinarily depend on the blood picture for his diagnosis. The presence of definite changes in the ear and of certain clinical signs and symptoms seem, as a rule, a sufficient basis on which to determine whether surgical intervention is indicated. In some cases of deep-seated suppuration, mastoiditis and sinus thrombosis, however, the clinical evidence may be misleading, and it is in these cases that laboratory aids such as blood culture, sedimentation time and study of the blood picture become of diagnostic and, possibly, of prognostic importance.

REVIEW OF THE LITERATURE

The value of the ordinary blood count, i. e., the number of white blood cells and the differential count, especially the polymorphonuclear neutrophils, has long been established by Ehrlich,[1] Türk[2] and others. In some severe infections, Türk, Engel,[3] Rieder[4] and Schindler[5] have noted the presence of premature cells, such as myelocytes, which were considered an index of the reaction of the bone marrow to a grave infection. The presence of myelocytes is now considered a part of the leukocytic shift to the left. It was also noted by these observers that in some severe infections the number of white blood cells and the polymorphonuclear cells showed no marked variations from the normal. In

* Submitted for publication, March 21, 1931.

* From the Otologic Service and Laboratories, Mount Sinai Hospital.

1. Ehrlich, P.: Diseases of the Blood, in Nothnagel: Encyclopedia of Practical Medicine, Philadelphia, W. B. Saunders Company, 1905.

2. Türk, W.: Klinische Untersuchungen über das Verhalten des Blutes bei acute Infectionskrankheiten, Leipzig, W. Braumüller, 1898.

3. Engel, C. S.: Diagnostischer Leitfaden für Sekret-und Blutuntersuchungen, ed. 2, Leipzig, Georg Thieme, 1920, vol. 15.

4. Rieder, H.: Beitrage zur Kenntnis der Leukocytose und verwandter Zustände des Blutes, Leipzig, F. C. W. Vogel, 1892, p. 12.

5. Schindler, C.: Untersuchungen über das Auftreten der Myelocyten im Blute, Ztschr. f. klin. Med. **54**:512, 1904.

1904, Arneth [6] showed that these changes were present in the blood, but that, owing to failure to study the various types of polymorphonuclear cells, they were not recognized. Arneth believed that there was marked destruction of the mature cells in the blood by the bacterial toxins, combined with the reaction of the bone marrow to these toxins. This led to the appearance in the blood of immature polymorphonuclear cells, which were easily recognized by the lack of marked lobulation of the nuclei. He divided the polymorphonuclear cells into five groups and several subgroups, depending on the shape and number of lobules of the nucleus. In charting the cells, his method was to start at the left with the cells with one lobule to the nucleus, then two lobules to the nucleus, and so on. In infections there is usually an increase in the number of immature polymorphonuclear cells or a "shift of the cells to the left"; this may be the only change found in some infections. At this time the Arneth count was considered cumbersome and impracticable. Türk criticized Arneth's conclusions in regard to determining the age of a cell merely with respect to the lobulation of the nucleus, and suggested the division of the cells into two main groups, such as segmented and nonsegmented polymorphonuclear cells. This method of classification was also recommended recently by Kothe and Hirshfeld,[7] and Farley, St. Clair and Reisinger,[8] who speak of filamented and nonfilamented, lobulated and nonlobulated polymorphonuclears, and segmented and nonsegmented polymorphonuclears. Cooke [9] and Cooke and Ponder [10] have simplified the Arneth count, but the most important modification is that of Schilling,[11] which he calls the hemogram. This is a classification of the polymorphonuclear cells based on the morphology of the nucleus. It is a simple and useful procedure, and is done at the same time as the complete differential count. Schilling divided the neutrophils into four groups, namely, (1) myelocytes with single, round or oval nucleus; (2) young cells, with indented or horseshoe-shaped nucleus; (3) staff cells with thin, irregular, nonlobulated nucleus, and (4) segmented cells with lobulated nuclei. The myelocytes

6. Arneth, J.: Die neutrophilen Leukozyten bei Infectionskrankheiten, Deutsche med. Wchnschr. **30**:54, 1904; Qualitative Leukozytose, Leipzig, 1920.

7. Kothe, R., and Hirschfeld, H.: Ueber abnorm hohe Leukocytose bei schweren Infektionen, Deutsche med. Wchnschr. **33**:1253, 1907.

8. Farley, D. L.; St. Clair, H., and Reisinger, J. A.: The Normal Filament and Nonfilament Polymorphonuclear Neutrophil Count: Its Practical Value as a Diagnostic Aid, Am. J. M. Sc. **180**:336 (Sept.) 1930.

9. Cooke, W. E.: The Arneth Count, Lancet **2**:1040 (Nov. 17) 1928.

10. Cooke, W. E., and Ponder, E.: The Polymorphnuclear Count, Philadelphia, J. B. Lippincott & Company, 1927.

11. Schilling, V.: Das Blutbild und seine klinische Verwertung, ed. 2, Jena, 1926.

and young cells are not present in normal blood; the staff cells vary from 2 to 10 per cent in normal blood and the segmented cells, from 50 to 70 per cent. In infections, the staff cells and the young cells increase greatly, with or without the increase of the number of the leukocytes. From a diagnostic standpoint, this increase of the young and staff cells is important. A predominating increase in the number of myelocytes and young cells is known as a "regenerative shift" and is believed to indicate a good prognosis. A marked increase in the number of the staff cells alone is called a "degenerative shift" and is believed to indicate an unfavorable prognosis. In our work with otologic cases, however, we were unable to confirm these prognostic values of the Schilling hemogram.

The changes in the blood in otitic infections are analogous to those reported in suppurative surgical diseases. In such infections, the blood picture shows marked variations, depending on the invading organism, the extent of the infection, whether it is localized or generalized, the duration of the illness and the presence of associated complications. Advances made in the study of the blood picture in otology seem to have passed through three distinct periods, following the general trend of hematologic development and research in infections. In the first period, the work of Suckstorff [12] is typical. He studied cases of acute otitis media, mastoiditis and some complications. These cases were divided into two groups, those occurring in persons 10 years of age being placed in one group and those over this age in the other. In studying these cases only total white blood counts were made. In the second period, one might include all studies of the blood in which a total white blood count and a differential count were made. This brings us to the work of McKernon,[13] who emphasized the significant fact that when cellular bony structures like the mastoid bone are involved in a septic inflammation, the differential blood count, in the majority of cases, shows a lower polymorphonuclear percentage than when the septic process is present in soft tissues. In 1907, Sondern,[14] who was one of the pioneers in this field, pointed out the value of the differential count in surgical diseases, appendicitis, mastoiditis, etc., and obtained

12. Suckstorff, L.: Die Leukozytenwert bei den entzündlichen Erkrankungen des Ohres und Schlafenbein, Ztschr. f. Ohrenh. **45**:161, 1903.

13. McKernon, J. F.: Clinical Value of Differential Blood Count in Clinical Otology, New York M. J. **85**:114, 1907; Pyogenic Diseases of the Brain, Laryngoscope **18**:988, 1908.

14. Sondern, F. E.: General Considerations in Reference to Blood Examination in Surgical Disease, New York M. J. **85**:185, 1907; Value of Differental Leucocyte Count in Diagnosis, Am. J. M. Sc. **32**:889, 1906; Value of the Leucocyte Count in Sepsis, New York M. J. **83**:1245, 1906.

diagnostic and prognostic data thereform. Dench [15] did not find over 80 per cent neutrophils in any uncomplicated otitic case. He was skeptical as to the value of the blood count in mastoiditis, but felt it was of value in otitic complications. Darling,[16] in an attempt to determine how far an examination of the blood would furnish reliable indications for operation in complications of the middle ear, found that it was of value in cases of intracranial complication, but that it would not indicate whether he was dealing with acute otitis media or mastoiditis. Brandegee [17] quoted two cases in which the blood count was of great aid in subsequent procedure and prognosis; one was a case of otitic abscess of the brain and the other a case in which bilateral mastoiditis was suspected. McKernon, in a later publication, expressed his belief that the blood count in pyogenic diseases of the brain, such as abscess, meningitis and sinus thrombosis, was of value. Gibson [18] suggested the use of a chart to express the relation between the total white blood count and the percentage of polymorphonuclear cells. Wilson [19] and Walker [20] devised formulas that express a similar idea by a numerical index. The formula is as follows: IR=(T-10)—(P-70). IR represents the index of resistance of the patient; T, the total leukocyte count expressed in thousands, and P, the percentage of polymorphonuclear cells. Under normal conditions, the index of resistance should be close to zero. We used this method in a small series of otologic cases, but it did not prove to be of significant value.

In 1911, Urbanschitch [21] expressed the opinion that no diagnosis could be made from a study of the blood picture exclusively in diseases such as mastoiditis, acute otitis media, sinus thrombosis, abscess

15. Dench, E. B.: The Value of the Blood Count and the Examination of the Aural Discharge as Diagnostic Factors in Cases of Mastoid Involvement, Laryngoscope **18**:958, 1908; A Consideration of Brain Abscess of Otitic Origin, Ann. Otol., Rhin. & Laryng. **21**:737, 1912; Indications for the Mastoid Operation, New York M. J. **76**:681, 1907.

16. Darling, J. F.: The Clinical Value of Leucocyte Examinations in Suppurative Diseases Arising from the Middle Ear, Edinburgh, M. J. **25**:125, 1908.

17. Brandegee, W. P.: Clinical Value of the Differential Blood Count in a Case of Acute Brain Disease, and in a Case of Acute Double Mastoiditis, Ann. Otol., Rhin. & Laryng. **16**:11, 1907.

18. Gibson, C. L.: The Value of the Differential Leucocyte Count in Acute Surgical Diseases, Ann. Surg. **43**:485, 1906.

19. Wilson, L. B.: The Value of Sondern's Differential Leucocyte Resistance Line in the Diagnosis and Prognosis of Acute Appendicitis, Collected Papers of the Mayo Clinic **1**:280, 1905-1906.

20. Walker, O. J.: An Index of Body Resistance in Acute Inflammatory Processes, J. A. M. A. **72**:1453 (May 17) 1919.

21. Urbanschitch, E.: Die Bedeutung der Blutuntersuchung im Ohrenheilkunde, Monatschr. f. Ohrenh. **45**:681, 1911.

of the brain and meningitis. At about this time, the Schilling hemogram was employed rather extensively; it contributed largely to a period that might be regarded as the third in the development of blood studies in otology. Hesse [22] found that leukocytosis was present in acute otitis media and in mastoiditis. The Schilling hemogram aided him only in indicating the presence of an otitic complication. He could not determine from his studies whether he was dealing with acute otitis media and mastoiditis or with acute otitis unaccompanied by mastoiditis. Heideman,[23] from a careful analysis of his own excellent work, recognized the limitations of his observations and realized that even with a normal blood picture the existing mastoiditis might be severe. Von Balden,[24] whose views are still more conservative, believed that a specific blood picture is not present in infections in the ear. Occasionally, mastoiditis is associated with a peculiar intermittent absence of leukocytes, despite increasing pathologic changes in the mastoid bone, as reported by Frank and Smiley.[25]

According to Gale,[26] when disease is not present there exists what he terms a normal index in the blood; when infection is present, one encounters "a shift to the left." He considered the shift index unreliable in making a differential diagnosis between otitic complications, but believed that it may be used as a guide as to when to intervene surgically. In Glasscheib's [27] opinion, one could determine, from the differential blood count, what would be found at operation. He believed that when there was a polymorphonuclear count of from 85 to 90 per cent with a shift index of 1:3 (relation of staff cells to segmented cells) and an absence of eosinophils, one was dealing with a perisinus abscess. Furthermore, he believed that if one encountered a case in which the neutrophils constituted 90 per cent of the total differential count and there was an absence of eosinophils, with a shift index of 1:2 or 1:1, one would probably find a sinus thrombosis. He considered it possible to foretell an impending sepsis by studying the differential blood count.

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22. Hesse, W.: Das Blutbild und die Entstehungsbedingungen von Komplikationen im Anschluss, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:232, 1926.

23. Heideman, J. A.: Das Haemogramm im otogene Infektione, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **22**:203, 1925.

24. von Balden, L.: Die diagnostiche Bedeutung des Blutes bei otogenen Krankheiten, Beitr. z. Anat., Physiol., Path. u. Therap. Ohres **25**:227, 1927.

25. Frank, I., and Smiley, W.: Intermittent Absence of Leucocytosis in a Case of Acute Mastoiditis, Ann. Otol., Rhin. & Laryng. **39**:128, 1930.

26. Gale, K.: Blood Shifting in Otogenous Complications, Laryngoscope **38**:538, 1928.

27. Glasscheib, A.: Die Bedeutung des Haemogramms für die Differential diagnose otogenen Komplikationen, Monatschr. f. Ohrenh. **61**:3, 1927.

One of the most complete and probably one of the best papers on this subject was written by Else Levy [28] in 1926. This investigator used the Schilling hemogram in studying almost all the otitic conditions usually encountered in an attempt to determine the diagnostic importance of the blood picture in otologic diseases. As a result, Levy concluded that the blood picture serves merely as an aid in making a diagnosis.

Weiss [29] carefully studied the blood picture in acute infections, including mastoiditis, sinus thrombosis, cellulitis, appendicitis, bacterial endocarditis and numerous other conditions, and tabulated the conditions that were associated with a moderate or marked increase in the immature cells. In this writer's opinion, the Schilling hemogram was of value in all surgical conditions, especially in sinus thrombosis. Niehaus [30] attributed great value to this hemogram, having found it of help in mastoiditis, especially in several of his cases in which there was a low total leukocyte count. Piney [31] believed that the hemogram was of great value.

This brings us to the final period, in which hematologists proceeded one step further and studied the cytoplasmic changes of the leukocytes in conjunction with the total white cell count and the Schilling hemogram. Following the suggestions of Cesaris-Demel,[32] Türk and Naegeli,[33] a considerable amount of attention has been directed to the study of the cytoplasm of the leukocytes. Alder and Schleip,[34] Gloor [35] and Mommsen [36] called attention to the profound changes in the cytoplasm of the polymorphonuclear cells. In severe infections, the polymorphonuclear cells are irregular and show swelling or conglomeration of

28. Levy, E.: Welche Diagnostik Bedeutung hat das Blutbild für die otogene Krankheiten? Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:495, 1926.

29. Weiss, A.: Newer Hematological Aspects of the Neutrophiles in Infections, Am. J. M. Sc. **174**:45, 1927.

30. Niehaus, F. W.: The Value of the Leucocyte Counts, According to the Schilling Formula, J. Lab. & Clin. Med. **14**:531 (March) 1929.

31. Piney, F.: The Significance of the Polynuclear Count and Schilling Hemogram, Quart. J. Med. **22**:405 (April) 1929.

32. Cesaris-Demel, A.: Ueber die morphologische Struktur die morphologischen und chromatischen Veränderung der Leukozyten, auf Grund der Untersuchungen der Methode der Vitalfarbung des Blutes, Virchows Arch. f. path. Anat. **19**:1, 1909.

33. Naegeli, P.: Blutkrankheiten und Blutdiagnostik, ed. 4, 1923.

34. Alder, A., and Schleip, K.: Atlas der Blutkranheiten, ed. 2, Berlin, Urban & Schwarzenberg, 1928.

35. Gloor, W.: Die klinische Bedeutung der qualitativen Veränderung der Leukozyten, Leipzig, Georg Thieme, 1929.

36. Mommsen, H.: Ueber die neutrophilen Granulationen der Leucocyten und ihre gesetzmässige Veränderung bei Scharlach und Lobare Pneumonie, Jahrb. f. Kinderh. **116**:293, 1926.

the granules, which stain intensely with the usual polychrome stains. These are called toxic or degenerative granules (figs. 1 and 2).

D'Onofrio [37] found that an intracranial complication could be ruled out when less than 80 per cent of polymorphonuclear leukocytes were present in the differential blood count. When a sudanophilia (using the method of Cesaris-Demel) was present, it was indicative of extradural abscess, meningitis or sinus thrombosis. D'Onofrio was the first investigator to study the cytoplasmic changes in otologic cases.

The persistence of these cytoplasmic changes, namely, the toxic granules, indicative of an intense infection, and their persistence in

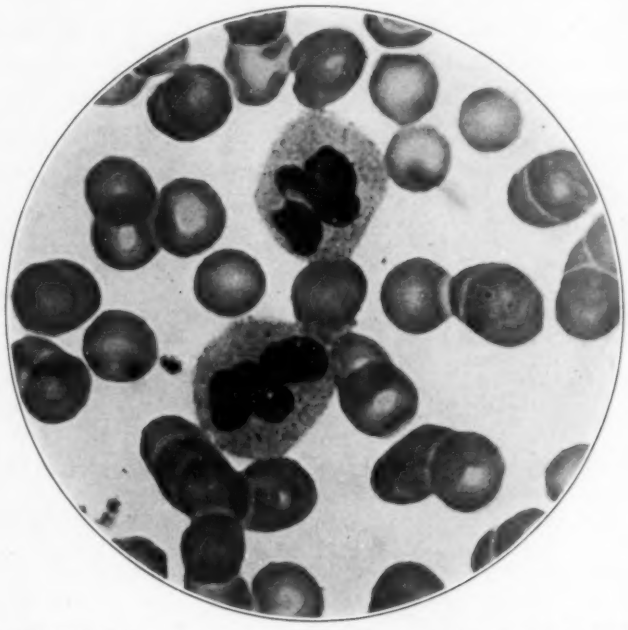

Fig. 1.—Blood smear from a case of acute otitis media showing normal segmented polymorphonuclear cells.

large numbers, is significant of a grave prognosis. These changes should be noted in all differential counts. The number of polymorphonuclear leukocytes with degenerative granules, divided into the total number of polymorphonuclears, is referred to as the degenerative index (Rosenthal and Kugel [38]). Normally this is zero, and when one encounters a degenerative index over 95 per cent, it indicates a grave prognosis.

37. d'Onofrio, F.: Ricerche ematologiche nei malati di mastoidite e complicanze endocraniche, Arch. ital. di otol. **32**:160, 1921.

38. Kugel, M., and Rosenthal, N.: Am. J. M. Sc., to be published.

AUTHORS' PROCEDURE

The number of leukocytes was determined in all of the cases in the present series in the usual manner. The differential count was done according to the method of Schilling, except that the young forms were combined with the staff cells. The number of cells showing cytoplasmic changes were noted at the same time for the degenerative index. The presence of vacuolization of the cytoplasm and Döhle [39] inclusion bodies was also noted.

For the proper study of the cells, a standardized method of staining is important; in our experience, the Jenner-Giemsa [40] stain gave the best results.

Observations on the Blood in Otitic Infections.—External Otitis: Our series included about ten cases of uncomplicated external otitis, in which there was an antecedent history of trauma of some sort. Nothing abnormal or characteristic was found on examination of the blood.

Acute Otitis Media: About twenty cases of acute otitis media were studied. All the varying factors that might influence the count were considered, namely, the common association of an intercurrent infection of the upper respiratory tract, pneumonia, adenitis, high fever, the duration of the illness, the offending organism, whether there was retention of pus under pressure in the middle ear, etc. Only such cases were included as could definitely be classified as acute otitis media without mastoiditis. The following cases illustrate the typical findings one may encounter.

CASE 66.—A boy, aged 12 years, presented bilateral bulging ear drums, none of the landmarks being visible, pain, a temperature of 102 F., a total white blood count of 17,000 with 42 per cent segmented cells and 33 per cent staff cells, a definite shift to the left. Of interest, was the fact that the degenerative index was zero, indicating a complete absence of toxic granules in the polymorphonuclear cells. Following myringotomy, there was a prompt recession of the symptoms, and the shift to the left moderated markedly.

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39. Döhle, W.: Leukocytenschlüsse bei Scharlach, Centralbl. f. Bakteriol. (originale) lxi, P½, p. 63, 1911.

40. The method of staining was as follows: 1. Jenner stain (made by National Aniline Company) was used, sufficient to cover the slide for one minute. 2. This was covered with distilled water with the proper H-ion concentration (6.4-6.8) for three minutes. 3. After the solution was poured off, the slide was covered with Giemsa stain for ten minutes. 4. It was washed with distilled water, and (5) the slides were allowed to dry.

Wright stain may also be used for identifying toxic granules. This stain should be diluted at the end of one minute, with buffered distilled water (p_H 6.4) for five minutes, and then washed with distilled water. Control smears are usually desirable. This can be done by using one half of the smear for the patient's blood and the rest of the slide for a normal person's blood.

CASE 3.—An adult, aged 28, had the clinical picture of acute otitis, with a white blood count of 10,000, 61 per cent segmented cells, 10 per cent staff cells, no young forms and a degenerative index of zero. With resolution of the ear, there was slight change in the hemogram; there were 59 per cent segmented cells and 9 per cent staff cells, while the degenerative index remained zero.

This case presents the typical features of uncomplicated cases of acute otitis media. On the other hand, we occasionally noted the picture shown in the following case:

CASE 8.—The patient was admitted to the hospital with fever, bilateral acute otitis and evidence of an acute infection of the upper respiratory tract. The

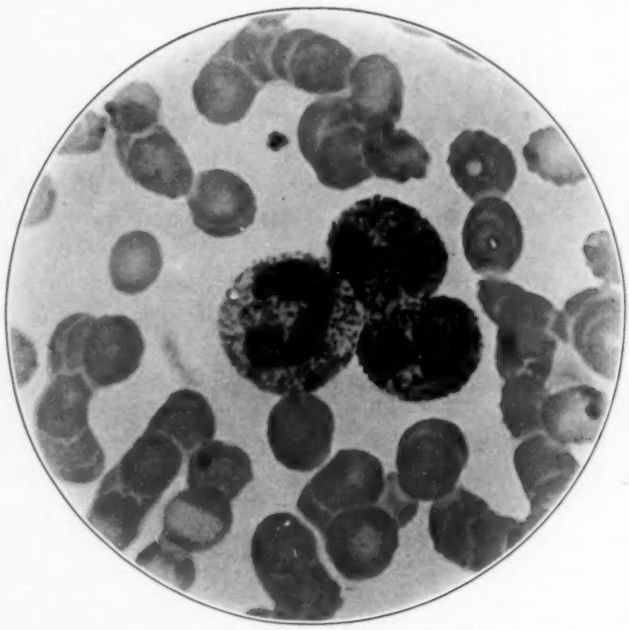

Fig. 2.—Blood smear from a case of sinus thrombosis showing segmented and 2 staff cells with "toxic granules" in the cytoplasm.

white cell count was 12,500, with 26 per cent segmented cells, 25 per cent staff cells, 41 per cent lymphocytes, 6 per cent monocytes and 1 per cent plasma cells.

The marked reaction noted in this case seemed to us to be part of the acute infection of the upper respiratory tract.

Case 5 illustrates another instance.

CASE 5.—A boy, aged 6 years, presented acute otitis media and associated bronchopneumonia; his temperature was 101 F. The white cell count was 28,000, with 32 per cent segmented cells, 31 per cent staff cells, 21 per cent lymphocytes and 14 per cent monocytes. With abatement of signs in the chest and resolution of the ears, the white cells decreased to 14,000 and the segmented cells increased to 46 per cent; the staffs fell to 22 per cent.

Of note in this case is the fact that the degenerative index was zero, despite the high white cell count.

Additional cases of acute otitis media might be cited from our series, although they would add little information. A leukocytosis from 8,000 to 20,000 may be present, with an increase in the staff count varying from 9 to 33 per cent, but without the presence of degenerative changes in the cytoplasm. There is, of course, no fixed rule; for example, a number of our cases of acute otitis media were associated with pneumonia. When the patients were seen at the onset of their illness, the picture at times closely simulated that of sinus thrombosis. These cases, assuredly, are not typical; the findings, in reality, are those of pneumonia.

Acute Mastoiditis: In this group, which comprises only cases of uncomplicated simple mastoiditis, an attempt was made in every instance to examine the blood before operation and repeatedly after operation, the object being to prognosticate in which cases complications would develop following operation and in which cases they would not. However, these studies did not assist us in anticipating the course of the case any sooner than did the clinical findings. In other words, significant changes in the blood were noted in patients who on the fifth or sixth day following a simple mastoidectomy had a chill and a rise in temperature to 106 F., and no other symptoms to account for this; but in the blood of such a patient twenty-four or thirty-six hours before the chill and rise in temperature we did not find any startling changes, despite the fact that an attempt was made to study all smears carefully.

Our cases of mastoiditis, simple, unilateral and bilateral, generally exhibited a degenerative index ranging from 0 to 20 per cent preoperatively; following exenteration of the diseased mastoid bone, the degenerative index fell gradually to zero. Postinfectious eosinophilia was found occasionally, especially if complicating pneumonia was present. On the other hand, it was commonly noted that cases in which *Streptococcus hemolyticus* was the causative factor, a marked monocytic reaction often developed.

The following representative cases of acute mastoiditis showed some interesting hematologic changes:

Case 59.—A man, who was acutely ill, was suffering from severe bilateral mastoiditis, associated with a virulent purulent sinusitis. The blood picture is shown in table 1.

This case is interesting because it reveals the effect of an associated virulent sinusitis on the degenerative index. With surgical drainage of both mastoids and conservative treatment for the sinusitis, a prompt subsidence of the toxic manifestation in the polymorphonuclear cells was evident. In this case the degenerative index remained 40 four days postoperatively, and fell to zero one week later.

CASE 27.—The findings in this case are more or less typical of a bilateral mastoiditis in an adult. The blood picture is shown in table 2.

This case is noteworthy because of the increase in the staff count and degenerative index following operation, which in this case could be explained by the cellulitis that developed about the wound. The patient made an uneventful recovery.

CASE 24.—This case is of interest. A woman, aged 36, was admitted to the service of Dr. Friesner, with the typical clinical findings of acute mastoiditis. Simple mastoidectomy was performed, and during the operation an unusually large emissary vein was exposed as it emptied into the lateral sinus. The vein was accidentally torn, and profuse bleeding resulted. The postoperative course was

TABLE 1.—*Data in Case 59*

Case 59	Pre-operative	4 Days Post-operative	7 Days Post-operative	Comment
White blood cells	9,600	10,000	8,200	This patient was discharged well on the fourteenth day
Segmented	55	54	60	
Staff	30	22	14	
Young	.....	.....	.....	
Lymphocytes	12	16	20	
Monocytes	2	6	4	
Eosinophils	1	2	2	
Degenerative index	40	40	0	

TABLE 2.—*Data in Case 27*

Case 27	Pre-operative	4 Days Post-operative	8 Days Post-operative	14 Days Post-operative
White blood cells	22,000	15,600	16,800	12,000
Segmented	55	37	40	54
Staff	31	46	33	19
Young	0	0	0	0
Lymphocytes	6	10	15	16
Monocytes	8	7	12	7
Eosinophils	0	0	0	2
Degenerative index	3	80	7	0

stormy. It was feared that traumatic sinus thrombosis would develop, and when the temperature suddenly rose to 105.6 F., we felt that this might be occurring. However, the negative blood culture together with careful watching of the blood picture, especially the degenerative index, led us to believe that we were not dealing with sepsis; subsequent results indicated that we were correct. The patient made a complete recovery. The blood picture is shown in table 3.

The average findings in all of our cases of mastoiditis in this series are given in table 10.

Chronic Otitis Media: In the cases of chronic otitis media with a long-standing history of otorrhea unassociated with any of the complications such as cerebellar abscess or epidural abscess, we felt that the blood picture was not of much significance. The blood picture in chronic otitis media was similar to that noted in chronic mastoiditis and in cases

of cholesteatoma. In table 10, our data on cases of chronic otitis media in which radical mastoidectomy was done and on cases of cholesteatoma are grouped.

Sinus Thrombosis: Seven cases of sinus thrombosis were studied. The following cases were considered most interesting:

Case 26.—This case is of extreme interest, first, because of the high degenerative index noted after the left mastoidectomy performed on the patient's first admission to the hospital; second, because the patient, on being readmitted one month later, showed all the clinical criteria of mastoiditis on the right side. A mastoidectomy was done, and the boy was doing nicely, apparently making an uneventful recovery, until, on the fifth day after the operation, when he had a chill associated with a rise in temperature to 106 F., the blood culture was

Table 3.—*Data in Case 24*

Case 24	Pre-operative	2 Days Post-operative	6 Days Post-operative	10 Days Post-operative	14 Days Post-operative	19 Days Post-operative
White blood cells	13,500	21,400	13,000	23,000	13,600	10,000
Segmented	68	61	28	40	47	34
Staff	13	31	54	44	25	21
Young	0	0	0	0	.....	0
Lymphocytes	9	4	9	9	23	35
Monocytes	8	4	9	9	6	10
Eosinophils	1	0	.....	.....	.....	.....
Basophils	1	0	.....	.....	.....	.....
Degenerative index	0	10	20	30	4	0

Table 4.—*Data in Case 26*

Case 26	Pre-operative First Admission	6 Days Post-operative	14 Days Post-operative	Pre-operative Second Admission	6 Days Post-operative
White blood cells	28,000	13,000	9,000	17,000	17,500
Segmented	60	31	44	38	16
Staff	24	27	18	9	57
Young	0	0	0	0	0
Lymphocytes	10	30	34	46	21
Monocytes	6	2	3	6	6
Eosinophils	1	7	1	1	0
Degenerative index	19	24	0	0	100

reported positive for *Bacillus pyocyaneus*. The sudden rise in the degenerative index was indicative of an extremely grave prognosis. This was all too true, for the patient died soon after the operation on the sinus.

Case 53.—This case is typical and atypical of the findings noted in primary thrombosis of the bulb of the jugular vein. A girl, aged 13, on admission to the hospital appeared acutely ill, with evidence of acute otitis media; according to the history she had had daily chills and a rise in temperature to 104 F. The spleen was palpable and the hemoglobin was diminishing; after ruling out pneumonia, influenza and bacterial endocarditis, an Ottenberg[41] jugular blood culture was taken; this was reported positive for *Streptococcus hemolyticus*, 12 colonies per cubic centimeter. All these findings indicated that the sepsis was most likely of otitic origin, and pointed to the urgency of obliterating the offending

41. Ottenberg, R.: Differential Blood Cultures in Sinus Thrombosis. J. A. M. A. **90**:1602 (May 19) 1928; The Diagnosis of Sinus Thrombosis, Arch. Otolaryng. **5**:43 (Jan.) 1927.

lateral sinus and jugular bulb. Following this procedure, we noted a decline in the degenerative index; this was analogous to the favorable clinical course that followed.

Of interest in this case (which is atypical) is the leukopenia that existed during the active stage of the *Streptococcus hemolyticus* sepsis, once again emphasizing the fact that one need not have the often reported leukocytosis of from 18,000 to 20,000. This patient did not have typhoid, tuberculosis, subacute bacterial endocarditis or any of the common conditions that are sometimes associated with a leukopenia. Throughout her stay in the hospital, the staff count ranged from 48 to 30. Later, it became normal.

TABLE 5.—*Data in Case 53*

Case 53	2 Days Post-operative	1 Day Pre-operative	10 Days Post-operative	16 Days Post-operative
White blood cells	5,000	5,600	12,000	12,000
Segmented	18	22	28	30
Staff	47	43	36	26
Young	6	6	0	0
Lymphocytes	28	25	29	40
Monocytes	7	4	6	4
Eosinophils	.....	.....	.....	.....
Myelocyte	.....	.....	1	.....
Degenerative index	90	90	1	0

TABLE 6.—*Data in Case 25*

Case 25	Pre-operative	6 Days Post-operative	14 Days Post-operative	Comment
White blood cells	25,000	19,600	12,800	Spinal tap revealed marked pleocytosis, but culture of the spinal fluid was negative
Segmented	36	34	47	
Staff	53	24	8	
Young	2	0	0	
Lymphocytes	3	30	36	
Monocytes	5.5	7	8	
Eosinophils	0	5	1	
Basophils	0.5	0	0	
Degenerative index	41	39	8	

Epidural Abscess and Perisinus Abscess: In many of our cases of mastoiditis, especially those of long standing, and those in which the causative organism was *Streptococcus hemolyticus* or pneumococcus, type III, extensive perisinus and occasional epidural abscesses were revealed at the time of the operation. Often there were small collections of pus and large amounts of thickened granulation tissue covering the lateral sinus and the dura of the middle fossa. Eosinophilia was not present in any of our cases. In most of them, the blood picture was similar to that in mastoiditis, with the exception, however, that there was an increase in the staff cells. One may suspect perisinus or epidural abscess when the clinical symptoms of the mastoiditis are marked and are associated with an increased staff count and high degenerative index. On the other hand, one can often venture this diagnosis, clinically,

with some surety when one notes the long history, the spontaneous pain, the tenderness far back over the region of the emissary vein and all the other signs of mastoiditis, and positive roentgen evidence showing localized cloudiness over the sinus. A few examples of these cases are given in order to indicate our findings:

CASE 25.—The findings in this case are interesting because they closely correlate the clinical course. On admission, the patient had a severe epidural abscess and perisinus abscess, with sympathetic meningitis. With the subsidence of the process, following wide exenteration of the mastoid, exposing the diseased dura and sinus, the pleocytosis in the spinal fluid became less marked; the degenerative index decreased, and the patient made an uneventful recovery.

TABLE 7.—*Data in Case 10*

Case 10	Pre-operative	3 days Post-operative	5 Days Post-operative	18 Days Post-operative	Comment
White blood cells	20,000	13,600	14,000	10,000	The causative organism was a pneumococcus type II; we know, however, that it is not so serious an etiologic factor in children
Segmented	29	25	28	51	
Staff	47	46	24	27	
Young	2	0	0	0	
Lymphocytes	17	20	40	17	
Monocytes	5	8	7	4	
Eosinophils	.....	1	1	1	
Degenerative index	73	71	53	2	

TABLE 8.—*Data in Case 54*

Case 54	Pre-operative	4 Days Post-operative	12 Days Post-operative	Comment
White blood cells	9,200	16,000	15,000	Patient had a simple mastoidectomy; following the operation focal signs of an intracranial lesion developed
Segmented	41	27	40	
Staff	40	52	38	
Young	2	0	0	
Lymphocytes	9	13	13	
Monocytes	8	8	8	
Eosinophils	0	0	1	
Degenerative index	40	32	80	

CASE 10.—This young patient appeared much more ill than one with an uncomplicated mastoiditis. On examination of the blood (especially noting the degenerative index of 73), we felt certain that we were dealing with an otitic complication. Operation revealed the presence of a huge perisinus abscess. The patient made an uneventful recovery, and the degenerative index fell to 2 per cent. Despite the 27 per cent staff cells which were present at the time we felt that the prognosis was excellent.

Abscess of the Brain of Otitic Origin: Not much need be said of otitic abscess of the brain. It is not possible to discuss this subject further than to state that it is generally a definite symptom complex, clinically following acute mastoiditis; it offers more difficulty in diagnosis, following long-standing chronic discharge from the ears, with or without radical mastoidectomy.

CASE 54.—Following a blood count made twelve days postoperatively, the patient in this case was transferred to the neurosurgical service, and an explor-

atory operation was performed to determine whether abscess of the brain was present. The abscess was located and drained, but the patient died two days later. Postmortem examination revealed gangrenous abscess of the brain and terminal meningitis.

On the basis of our findings, we do not feel justified in venturing an opinion as to a diagnosis based on the blood picture alone. However, progressive increase in the degenerative index, in conjunction with the clinical picture, is significant and indicates an intense infection and a grave prognosis.

Otitic Meningitis: We have not seen many cases of meningitis since we began the study of this series two years ago, but it is a complication that offers no difficulty in diagnosis. We are considering only otitic bacterial meningitis. Cases of epidural abscess with associated sympathetic meningitis, of which we have an example, are considered under epidural abscess.

TABLE 9.—*Data in Case 2*

Case 2	12/18/29	12/19/29	12/22/29	12/27/29	1/2/30	1/7/30
White blood cells.....	9,200	8,400	12,000	11,600	6,600	7,000
Segmented.....	40	37	35	39	48	45
Staff.....	12	25	20	14	5	10
Young.....	0	0	0	0	.....	0
Lymphocytes.....	34	25	33	35	37	39
Monocytes.....	14	12	10	9	10	5
Eosinophils.....	0	1	2	3	.....	1
Degenerative index.....	30	6	3	0	0	0

CASE 13.—An adult was operated on for acute mastoiditis. Postoperatively, he complained of dizziness and had signs of a serous labyrinthitis. The dizziness and all subjective complaints subsided, and the patient was discharged to the follow-up clinic twenty-four days later. He was kept under observation. Five weeks after the mastoidectomy, while walking home from the x-ray laboratory, he collapsed. He was brought to the hospital, and on examination it was noted that he had meningitis. Lumbar puncture confirmed the diagnosis; pneumococcus type III from the spinal fluid on smear and culture was recovered—the same organism that was found in the mastoid. The patient succumbed eight hours after admission to the hospital. Postmortem examination revealed an invasion directly through the supralabyrinthine cells, with a direct extension meningitis. Only one blood count could be obtained on this patient, and the total count was 28,000, with 12 per cent segmented cells, 61 per cent staff cells, 2 per cent young forms, 2 per cent myeloblasts, 3 per cent lymphocytes, 19 per cent monocytes and a degenerative index of 61.

Gradenigo's Syndrome: It was with a great deal of interest that we studied two cases with a typical Gradenigo syndrome. The findings in one of these cases (table 9) are significant.

CASE 2.—A girl, aged 12 years, presented a classic so-called Gradenigo syndrome. Throughout her stay in the hospital, the monocyte count was persistent and high (fig. 3) regardless of whether the blood was taken from the

finger or from the lobule of the ear. With the complete disappearance of the paresis of the sixth nerve, the monocytosis disappeared, and the degenerative index remained zero. The patient made an uneventful and complete recovery. We were of the opinion that the process in the petrous pyramid could not be progressing, since the degenerative index was diminishing.

Carcinoma of the Mastoid: One case of carcinoma of the mastoid (case 90) was included in this series. It is of interest because it presents a problem in diagnosis. The painless onset of complete facial paralysis, the painless, profuse bleeding from the ear after mere inspection, the wide, broad base granulomas and the entire absence of any

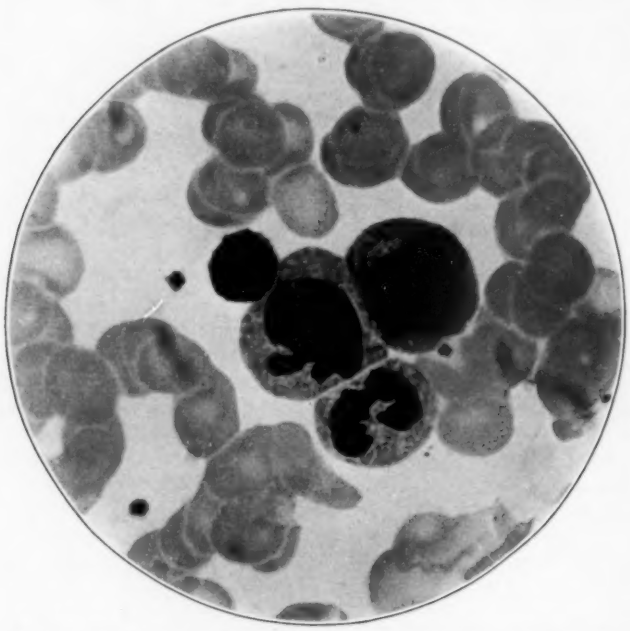

Fig. 3.—Blood smear in a case of Gradenigo syndrome showing 2 monocytes, a lymphocyte and polymorphonuclear cells. No degenerative changes were found in the polymorphonuclear cells.

landmarks in the ear were valuable diagnostic points. The belief that we were dealing with a carcinoma was confirmed by operation; biopsy revealed a squamous celled carcinoma. The blood picture was of little help in making a diagnosis. The white blood count varied repeatedly between 8,000 and 12,000. There were no degenerative changes in the cytoplasm or marked fall in the hemoglobin. There was practically the same blood picture as one encounters in uncomplicated chronic otitis media.

Bell's Palsy: During the time that this investigation was carried on, three cases of Bell's palsy came under observation; they were

usually associated with a history of a recent infection of the upper respiratory tract or some intercurrent infections; the blood counts were found to be normal and the degenerative index to be zero.

SUMMARY

Over 100 cases of otitic infections and otitic complications were studied with respect to the leukocytic variations, types of cells, especially the segmented and nonsegmented cells, and the cytoplasmic changes (degenerative index).

Cases of external otitis are not associated with any abnormal blood changes.

Acute otitis media is usually associated with a mild leukocytosis (rarely up to 20,000), and there is occasionally an increase in the non-segmented cells. In uncomplicated cases we rarely encountered degenerative cytoplasmic changes.

In our cases of mastoiditis there was moderate leukocytosis undistinguishable from an acute otitis media, but there was a somewhat higher percentage of nonsegmented cells and also a slightly more marked number of cases showing degenerative changes. However, it is our belief that in the majority of cases one cannot distinguish between these conditions solely on the basis of the blood picture.

There were no marked changes in the blood in our cases of chronic otitis, except in an acute exacerbation of a chronic otitis, and in these cases the picture was that of acute otitis.

In cases of epidural abscess complicating acute mastoiditis, we found marked leukocytosis, more than was encountered in simple mastoiditis with an associated increase in the nonsegmented or staff cells up to 50 per cent and, most significant, a high degenerative index.

In our cases of sinus thrombosis and thrombosis of the bulb of the jugular vein the total leukocyte count varied from 5,000 to 28,000 pre-

TABLE 10.—*Résumé of Cases in This Series*

Otitic Condition	Number of Cases	Blood Picture at Onset: White Blood Cells	Blood Picture at Onset: Staff Cells, per Cent	Blood Picture at Onset: Degenerative Index, per Cent
1. External otitis	10	8,000–12,000	3–12	0
2. Acute otitis media	20	8,000–20,000	9–33	0– 10
3. Acute mastoiditis	45	9,000–20,000	16–36	0– 20
4. Chronic mastoiditis (includes chronic purulent otitis media) (cholesteatoma)	10	8,000–14,000	12–26	0– 18
5. Perisinus abscess	4	14,000–20,000	30–50	10– 70
6. Epidural abscess	3	16,000–25,000	34–53	16– 50
7. Sinus thrombosis	7	5,000–25,000	25–62	.. 100
8. Abscess of the brain	1	15,000–20,000	38–50	27– 45
9. Meningitis, bacteremia	2	16,000–28,000	61–70	40– 60
10. Labyrinthitis, suppurative	2	 30,000	.. 70	.. 60
11. Gradenigo—syndrome	2	6,000–12,000	10–24	0– 26
12. Carcinoma of the mastoid	1	7,000–14,000	10–20	0
13. Bell's palsy	2	7,000–10,000	0–10	0

operatively, and the differential count seemed to indicate a mild or marked shift to the left, but the degenerative index was always high. In cases of overwhelming sepsis, such as those due to *Bacillus pyocyaneus* or pneumococcus type III, the degenerative index may be as high as 100 per cent.

In all of the otitic complications (see table 10), perisinus abscess, abscess of the brain, meningitis and labyrinthitis, the changes in the blood were of value diagnostically and prognostically.

In one case of carcinoma of the mastoid the changes in the blood were of no significant importance.

CONCLUSIONS

1. The number of white blood cells and the ordinary differential count do not furnish sufficient evidence of the severity of an otitic infection.

2. The simplified Schilling hemogram is an important diagnostic aid in otitic infections; the study of the young and of the staff cells during the course of otitic infections furnish important evidence of the intensity of the existing infection.

3. Observations of the cytoplasmic changes of the polymorphonuclear cells (toxic granules, vacuolization) are extremely important, from the prognostic standpoint. The relation between the polymorphonuclear cells showing toxic granules to the normal polymorphonuclear cells is the degenerative index. A steady rise of the degenerative index to about 80 per cent is indicative of an extremently grave prognosis. A rapid fall of this index to normal is of good prognostic import.

4. The degenerative index runs parallel with the pathologic changes or the extent of the suppurative focus.

5. The hemoglobin and red cells are rarely disturbed in the ordinary otitic infections, such as external otitis, acute otitis media, uncomplicated mastoiditis; in other words, only in infections associated with bacteremia, namely, sinus thrombosis, meningitis, in which one notes rapidly failing hemoglobin and a corresponding fall in the number of red blood cells.

It is our opinion that careful study of the blood, with especial emphasis in regard to the degenerative index, will yield more accurate information than will merely a consideration of the leukocyte count and a modified Schilling hemogram. Such types of blood studies seem to be particularly valuable as a diagnostic and prognostic aid in otitic complications.

FURTHER PROOF OF THE REGENERATION OF MUCOUS MEMBRANE IN THE HUMAN ANTRUM *

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My purpose in this paper is to present further proof that the mucous membrane in the human antrum regenerates following radical operation and to throw some light on the method whereby this regeneration is accomplished.

I have always believed that the new lining of the antrum after a radical operation is for the most part scar tissue. The experiments that Dr. Knowlton and I carried out on dogs were performed to find out what actually happens. They demonstrated that the mucous membrane of the antrum regenerates and is histologically normal. The regenerated mucous membrane must, of course, come from islands left at operation or grow in from the nose. Some investigators who have discussed the question of regeneration have spent much time on these two points. The whole point of this paper and of the one that preceded it is that after removal mucous membrane regenerates and is histologically normal. That it regenerates as normal mucous membrane over the whole of the antrum no one can say without examining every millimeter of the mucous membrane removed. It appears normal over the whole cavity. In some places there is an increase of fibrous tissue; in some places it may be all scar tissue. It would be foolish to argue this point. The fact remains, however, that the mucous membrane does regenerate. Where it comes from is not the question. To make an issue of the obvious is absurd.

Twenty-two specimens from Dr. Mosher's laboratory in the Massachusetts Eye and Ear Infirmary and four from the department of otolaryngology in the University of Toronto form the material for this paper.

The order of presentation is as follows: evidence of regeneration of epithelium; previous findings in the antrum following radical operation; findings in twenty-four antrums and two frontal sinuses in man following radical operation; the method of repair.

The epithelia of the body stand preeminent in their capacity for complete regeneration (Adami,[1] 1908).

* Submitted for publication, April 1, 1931.

* From the Department of Otolaryngology, University of Toronto.

1. Adami: Principles of Pathology, Philadelphia, Lea & Febiger, 1908, vol. 1.

Cells have an inherent tendency to multiply, and nowhere in the body will nature tolerate a surface denuded of epithelium whether it is skin or mucous membrane. Why, then, has the tradition that only scar tissue follows the radical operation on the antrum existed so long among otolaryngologists? I do not know, but one has only to refer to writings published as recently as 1930 or to talk with investigators who are regarded as authorities to realize how firmly this view has been fixed as one of the accepted views of otolaryngologists.

EVIDENCE OF REGENERATION OF EPITHELIUM

Fischer [2] found that cultures of epithelial tissue double their size in three or four days. Balbiani and Henneguy [3] showed that the ends of the tails of two tadpoles placed in contact after scarification grew together in an hour and a half by means of the superficial growth of the epithelial cells.

It is well known that where fistulous tracts occur leading into bone the epithelial cells, owing to their spreading property, may grow into the fistula and line the bony cavity. Large cavities occurring in the tissue of the lung may become lined with a layer of epithelium. The tremendous healing power of the skin is an everyday demonstration of the activity of epithelial tissue.

Heape [4] found that the uterus of the monkey was relined with epithelium about seven days after menstruation and about fourteen days after pregnancy. O'Leary [5] saw epithelization begin in the human uterus on the fourth day after menstruation. On the seventh day, the surface epithelium was complete in all the blocks he examined, but it varied in different areas from a high columnar type to a low flattened form. By the ninth day, the surface epithelium was complete, but was not of uniform height.

Even in the stomach in which epithelial regeneration has to contend with almost constant muscular activity and the irritation of foods and gastric juices, Ferguson,[6] working in Dr. Bensley's laboratory at Chicago, demonstrated that the gastric mucosa regenerated at the rate of 2 mm. per week over areas from which 25 sq. cm. had been excised. Not only the epithelium, but the specialized gland cells as well regenerated.

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2. Fischer, Albert: J. Exper. Med. **35**:367, 1922.

3. Balbiani, E. G., and Henneguy, F.: Compt. rend. Acad. d. sc. **123**:269, 1896.

4. Heape, Walter: Phil. Tr., London, 1894-1897, vol. 185.

5. O'Leary, James L.: Am. J. Anat. **43**:289, 1929.

6. Ferguson, A. N.: Am. J. Anat. **42**:403, 1928.

PREVIOUS FINDINGS IN THE ANTRUM FOLLOWING RADICAL OPERATION

In June, 1930, Carter [7] stated that "Bare bone does not procure for itself another periosteum nor does it remain alive. Ciliated epithelium once destroyed is never regenerated. Normal mucous glands do not reappear in the scar tissue which follows the destruction of mucous membrane nor is this scar tissue capable of performing any physiologic function."

Semenov and Kistner [8] recently reported observations made at biopsy on specimens from the antrums of patients who had undergone the radical operation. In none of these did he see regenerated glands or ciliated epithelium. One showed stratified squamous epithelium-like skin, and the others showed scar tissue with cubical or columnar cells in the overlying epithelium.

In 1928, Knowlton and I [9] demonstrated in dogs and in human beings that the mucous membrane of the antrum completely reformed after complete removal. The regenerated epithelium was of the ciliated columnar type and contained goblet cells. The underlying connective tissue stroma was thin and contained glands. The new lining was essentially normal. Many investigators received this new concept with great skepticism, but evidence is rapidly accumulating to substantiate it. Professor Teacher [10] of Glasgow said that after the removal of the lining of the antrum reepithelization is to be expected.

Coates and Ersner [11] found that epithelium regenerated in the frontal sinus of the dog; however, after the mucous membrane had been removed twice, they did not classify it as entirely normal. They found also, as in our experiments on the antrum of the dog, that glandular tissue appeared in the stroma some time after the surface had been epithelized. Inflammatory elements were present at the time of examination. This is to be expected because of the traumatization of the tissue necessary to accomplish removal of the lining.

Tonndorf [12] was fortunate enough to secure an autopsy in a man who had had a radical operation on the antrum one month before death.

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7. Carter, W. W.: Ann. Otol., Rhin. & Laryng. **39**:578, 1930.

8. Semenov, H., and Kistner, F. B.: Proc. Soc. Exper. Biol. & Med. **27**:332, 1930.

9. Knowlton, C. D., and McGregor, G. W.: How and When the Mucous Membrane of the Maxillary Sinus Regenerates, Arch. Otolaryng. **8**:647 (Dec.) 1928.

10. Teacher: Personal communication to the author.

11. Coates, G. M., and Ersner, M. S.: Regeneration of the Mucous Membrane of the Frontal Sinus After the Surgical Removal (in the Dog), Arch. Otolaryng. **12**:642 (Nov.) 1930.

12. Tonndorf: Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:54, 1928.

He noted granulation tissue originating over all parts of the antrum. Ciliated columnar epithelium was growing in from the naso-antral opening, and the ingrowing edge was flattened. Epithelium was also spreading from an island of mucous membrane left in the antrum at the time of the operation. Goblet cells were in evidence in the new epithelium.

Gorham and Bacher [13] did not find epithelium in the human antrum two weeks after operation, but after one month there was a loosely formed but unmistakable layer of ciliated columnar epithelium, the outer edges of which were flattened. There was also evidence of regeneration of the glands. Where glands were absent, large goblet cells were present. After two months the membrane had become thinner and more like the adult, while after ten months the authors found a perfectly formed ciliated columnar epithelium. In a number of the cases there were a few small partial partitions forming incomplete membranous pockets.

FINDINGS IN TWENTY-FOUR ANTRUMS AND TWO FRONTAL SINUSES IN MAN FOLLOWING RADICAL OPERATION

The twenty-six specimens that form the material for this article showed definite reformed columnar epithelium. All were ciliated except one. In each case a radical operation had previously been performed on the antrum, and in most, if not all, of them, the membrane had been removed as completely as possible—subperiosteal exenteration, or, as St. Clair Thompson termed it, decortication. The length of time following operation ranged from sixteen days to nine years.

The outstanding observation in this series of specimens is the presence of new epithelium sixteen days after operation, although the fact that it was so far advanced in the dog at one month should prepare one for such a surprise. It is extremely interesting to examine these tissues from human antrums at various stages of regeneration and to note that the process is essentially the same as that which takes place in the dog.

Sixteen Day Specimen from a Human Antrum.—The macroscopic appearance was that of a smooth-walled cavity lined with a very thin, velvety-appearing material, which was gray, quite moist and so thin and friable that it was difficult to remove a piece of sufficient size for examination. Microscopically, it consisted of a great number of young blood capillaries supported by a newly formed, delicate connective tissue in which there were many fibroblasts. Lymphocytes were scattered

13. Gorham, C. B., and Bacher, J. A.: Regeneration of Human Maxillary Antral Lining, Arch. Otolaryng. **11**:763 (June) 1930.

through the tissue. The nuclei of many of the endothelial cells that formed the capillary walls were still plump and pale staining. It was healthy granulation tissue (fig. 1).

On the surface of this tissue was definite regenerating epithelium (fig. 2). The epithelial cells were large, oval and pale staining. They seemed to be standing on end in a palisade arrangement along the surface and were not closely packed together (fig. 3). In some areas they were becoming more crowded and elongated, and there was evidence of the formation of two layers of cells, a basal layer and tall columnar cells extending beyond to form a second layer. No evidence

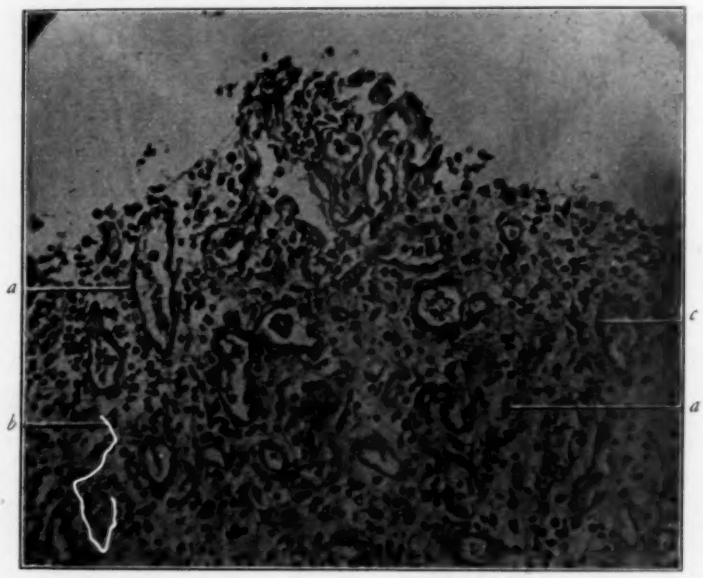

Fig. 1.—Granulation tissue in the human antrum sixteen days after operation, showing masses of young capillaries. Low power view. *a* indicates a capillary; *b*, a lymphocyte; *c*, an endothelial cell, and *d*, a connective tissue cell.

of goblet or ciliated cells was present, but a definite basement membrane was being formed. This regeneration was taking place in a patient so debilitated that it was not thought that he could survive more than a few months. The diabetes was so severe that 175 units of insulin a day were not sufficient to keep his blood sugar normal while he was on a basal diet. Added to this there was a streptococcic septicemia which caused his death sixteen days after operation. In one area of the antrum the organisms were seen growing on the surface in a colony (fig. 4) and penetrating the tissue for a distance of 0.3 mm. (fig. 5). The combination of a greatly lowered resistance with an area denuded of epithelium probably allowed the bacteria to enter the blood stream.

Fig. 2.—Sixteen day specimen from a human antrum, showing young regenerating epithelial cells growing on the surface of granulation tissue. Low power view. *a* indicates the basement membrane; *b*, epithelium.

Fig. 3.—Sixteen day specimen from a human antrum, showing young regenerating epithelial cells (*a*) growing on the surface of granulation tissue. High power view.

This is the only case in which I have been able satisfactorily to demonstrate organisms in the lining of the antrum, although I look for them as a routine measure. As a rule, bacteria are found in the tissue only when there has been a break or ulceration in the overlying epithelium, and these are not common observations in the lining of the sinuses.

Six Month Specimen from a Human Frontal Sinus.—The tissue was recovered from a frontal sinus from which the epithelium had been completely removed six months previously. To the eye it appeared to be completely relined with a normal mucous membrane. Microscopically, it showed complete regeneration of the epithelium (fig.

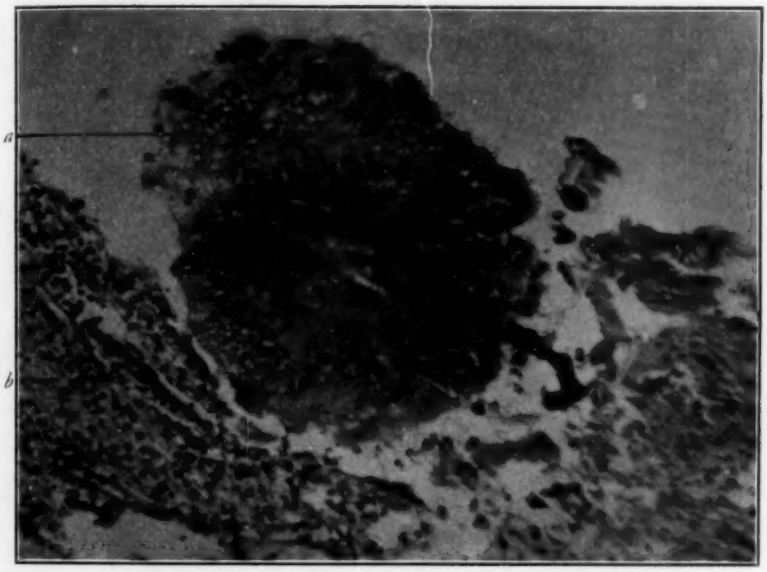

Fig. 4.—Sixteen day specimen from a human antrum, showing a colony of bacteria (*a*) growing on the surface of granulation tissue. The organisms have invaded the tissue to a depth of 0.3 mm. but only at this point. Low power view. *b* indicates polymorphonuclear leukocytes.

6). The basal layer of cells rested on a delicate basement membrane, and superficial to this were two or three layers of cells, some of which had the appearance of undistended goblet cells. The whole surface was almost a continuous layer of cilia. The stroma was still thicker than normal, was somewhat edematous and contained a few lymphocytes and plasma cells. The blood vessels were engorged. Although this was a small piece of tissue, there was evidence of the formation of glands.

Seven Month Specimen from a Human Antrum.—In this antrum, seven months after operation the surface appeared to be covered by

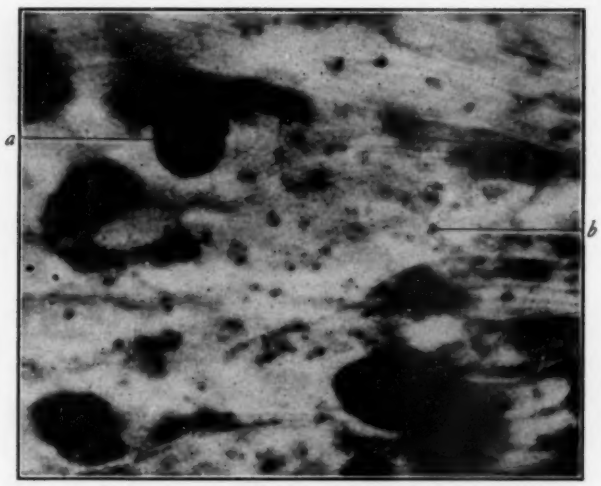

Fig. 5.—Sixteen day specimen from a human antrum, showing the bacteria (*b*) in the tissue. Oil immersion. *a* indicates a tissue cell.

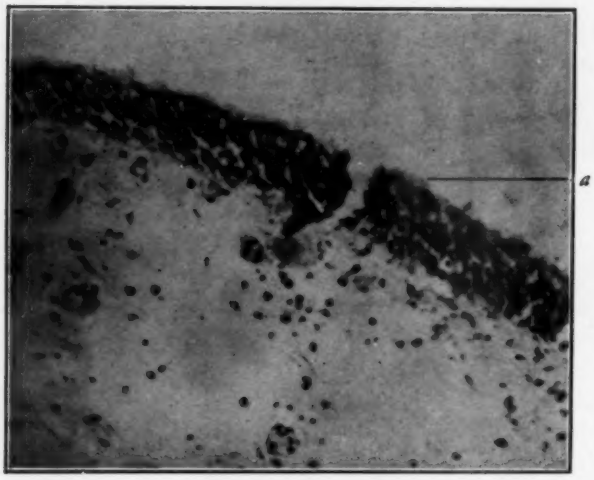

Fig. 6.—Six month specimen from a human frontal sinus, showing regenerated ciliated columnar epithelium (*a*). Low power view.

mucous membrane. A partial partition had formed, and this also appeared to be covered by mucous membrane. Microscopically, the surface was covered by epithelium composed of a basal layer on a delicate basement membrane and two or three layers of columnar cells. Many were goblet cells, and some were ciliated. Many glands were present in the stroma, and these appeared to be normal (fig. 7). The stroma had not yet contracted to its normal thickness. It was becoming fairly dense and had a few lymphocytes scattered through it.

Two Year Specimen from a Human Antrum.—At operation the lining of the antrum appeared to be perfectly normal, although the mem-

Fig. 7.—Seven month specimen from a human antrum, showing regenerated ciliated columnar epithelium (*b*) with glands (*a*) in the stroma. Low power view.

brane had twice been completely removed, the second time two years before this examination. Microscopic examination substantiated the gross appearance (fig. 8). It would be difficult to find a membrane in an adult more normal than this one. The three-layered epithelium rested on a very thin basement membrane, contained a great number of distended goblet cells (fig. 9) and was completely ciliated (fig. 10). The cells did not show evidence of degeneration. The stroma was very thin and contained a few lymphocytes. A considerable number of glands were present, and some of these showed slight dilatation.

A piece of tissue from a frontal sinus (fig. 12) from which the mucous membrane had been removed two and a half years before under the microscope revealed perfectly formed three-layered columnar

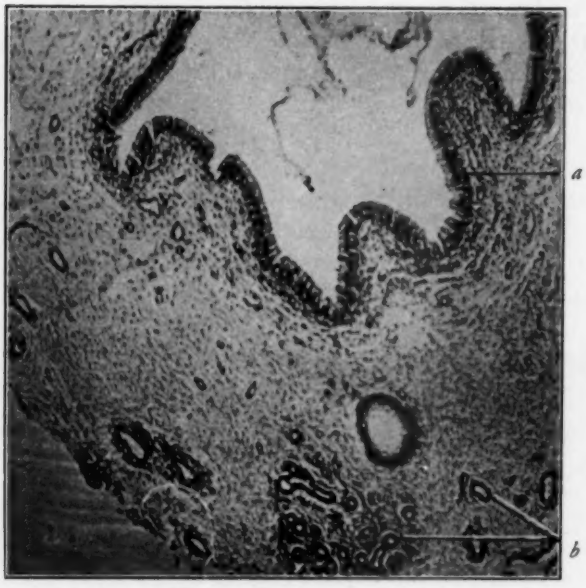

Fig. 8.—Two year specimen from a human antrum, showing regenerated ciliated columnar epithelium (*a*) with glands (*b*) in the stroma. Low power view.

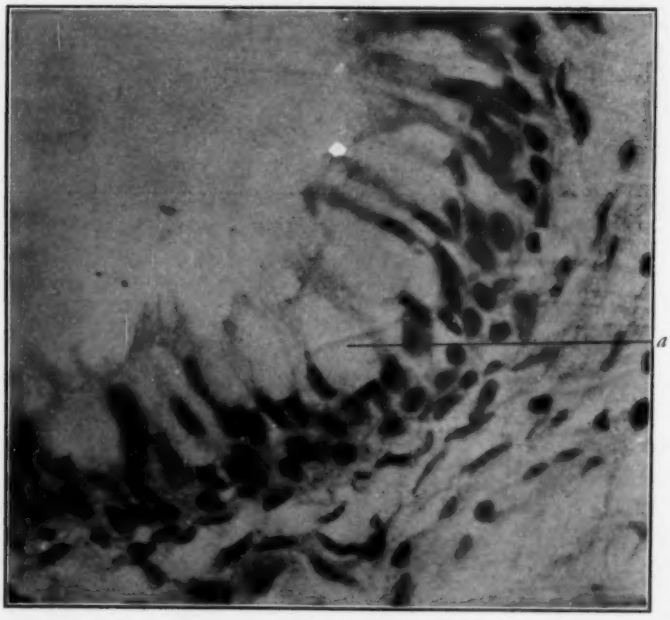

Fig. 9.—Regenerated columnar epithelium from a human antrum, showing goblet cells (*a*). High power view.

epithelium which was completely ciliated and rested on a normal basement membrane. The stroma showed the usual chronic inflammatory changes.

The remaining specimens were removed as a routine from the antrums of twenty-one patients who had been operated on as long as nine years previously. It was necessary to reopen the antrums because of the recurrence of symptoms. There is not sufficient available information to explain why a second operation was required in these cases. It is significant that although the sections were prepared according to

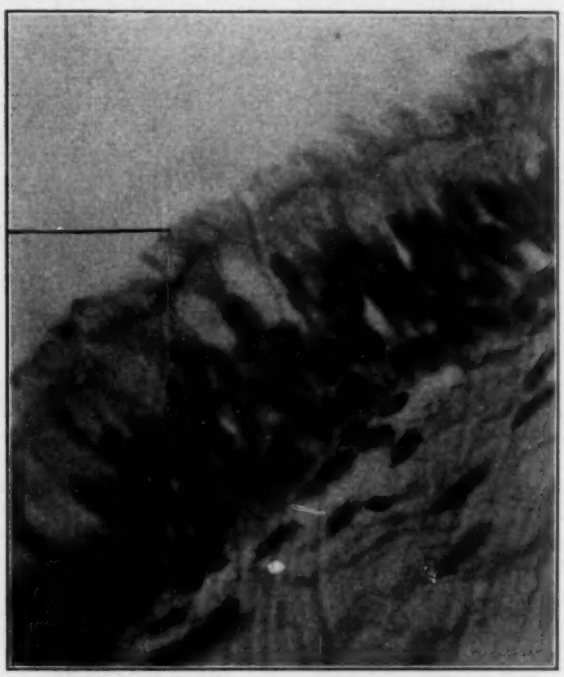

Fig. 10.—Regenerated columnar epithelium from a human antrum, showing cilia. High power view. *a* indicates ciliated epithelium.

routine measures, without any thought of special examination, not one failed to show a return of epithelium. In many cases the piece of tissue examined was very small, and it is likely that further examination would reveal more information.

All of the twenty-one specimens showed columnar epithelium (figs. 11 to 14). It was ciliated in all but one, and in this one only a small portion of epithelium that had not been destroyed could be seen. Approximately half contained goblet cells and half contained glands. In three-fourths edema and excessive connective tissue were present in some degree, while all presented definite evidence of chronic infection

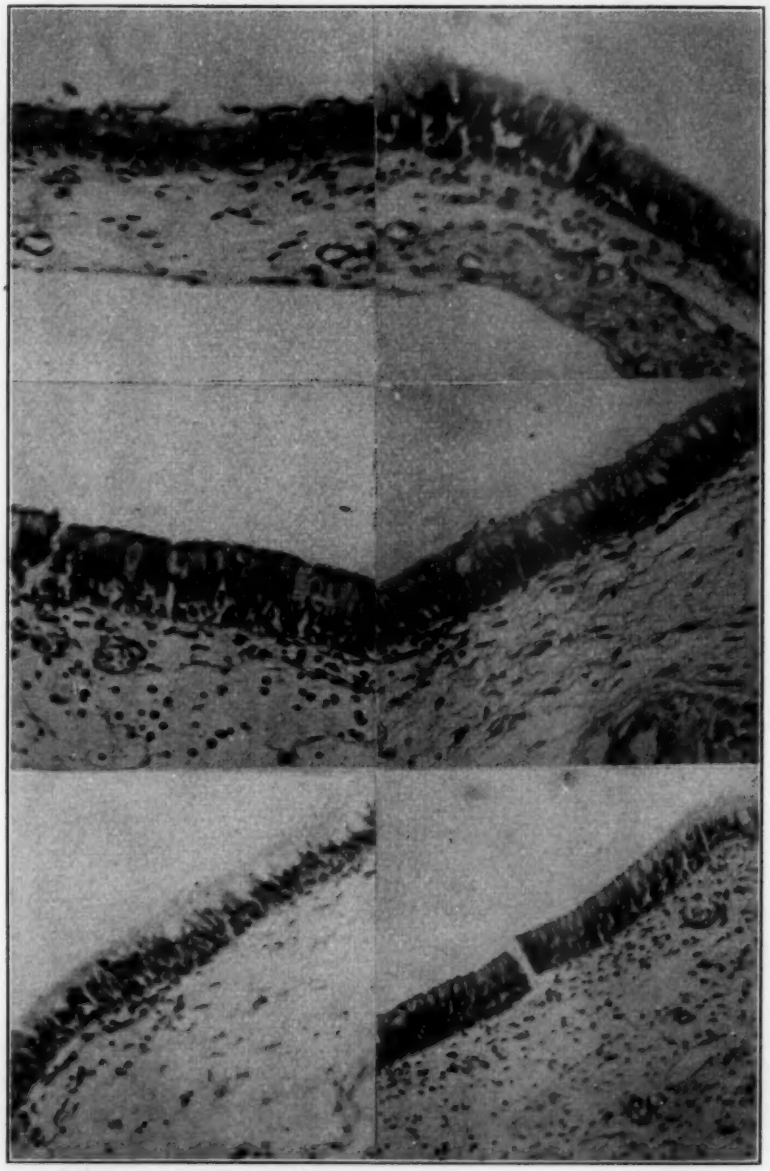

Fig. 11.—Specimens from human antrums, showing regenerated ciliated columnar epithelium. Low power view. These specimens and those which follow were removed at various intervals following the radical operation, the longest period being nine years.

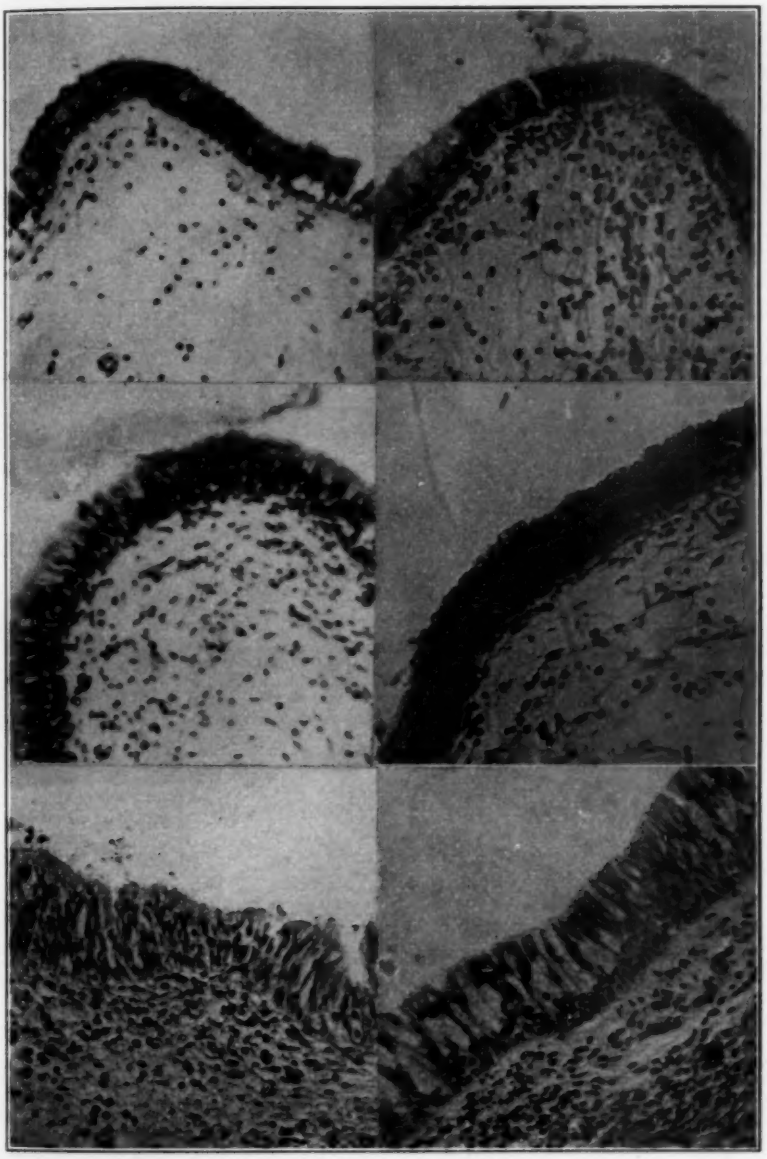

Fig. 12.—Specimens from sinuses in man. They all show regenerated ciliated columnar epithelium except the lower right, in which case the patient was not operated on; the antrum was normal. The middle one on the right is from a frontal sinus; the others are from antrums. Low power view.

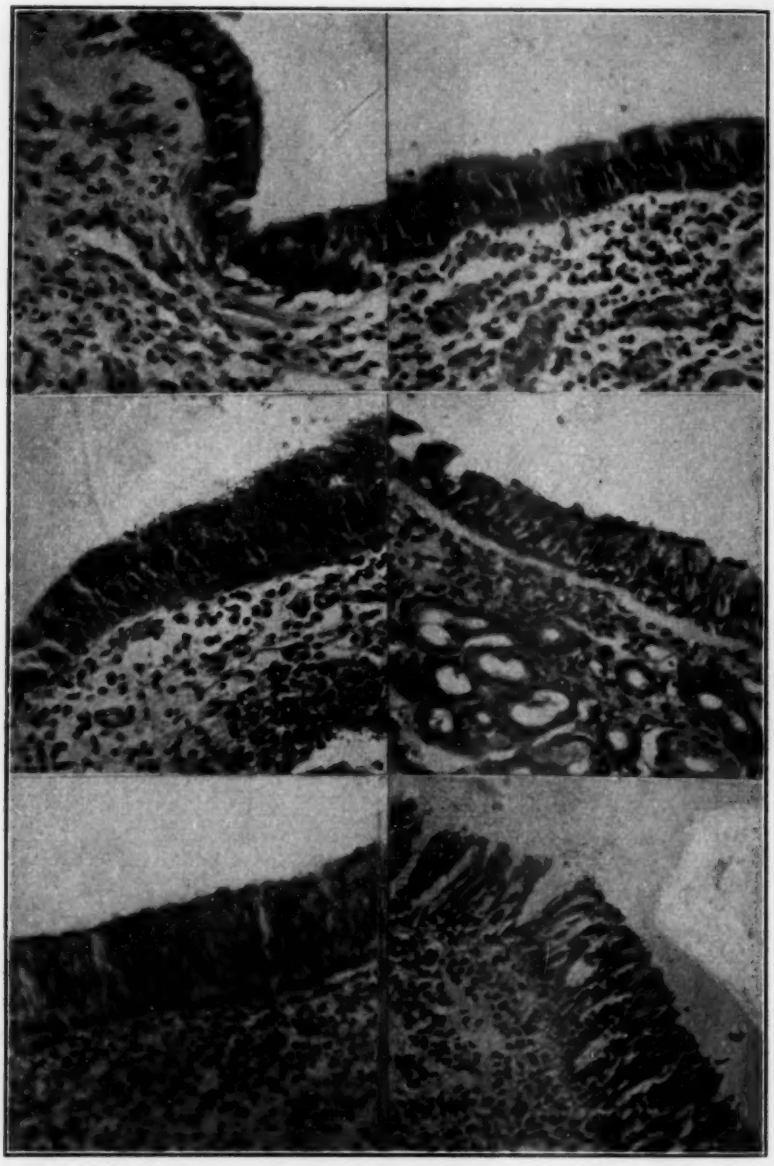

Fig. 13.—Specimens from human antrums, showing regenerated ciliated columnar epithelium. Note the glands. Low power view.

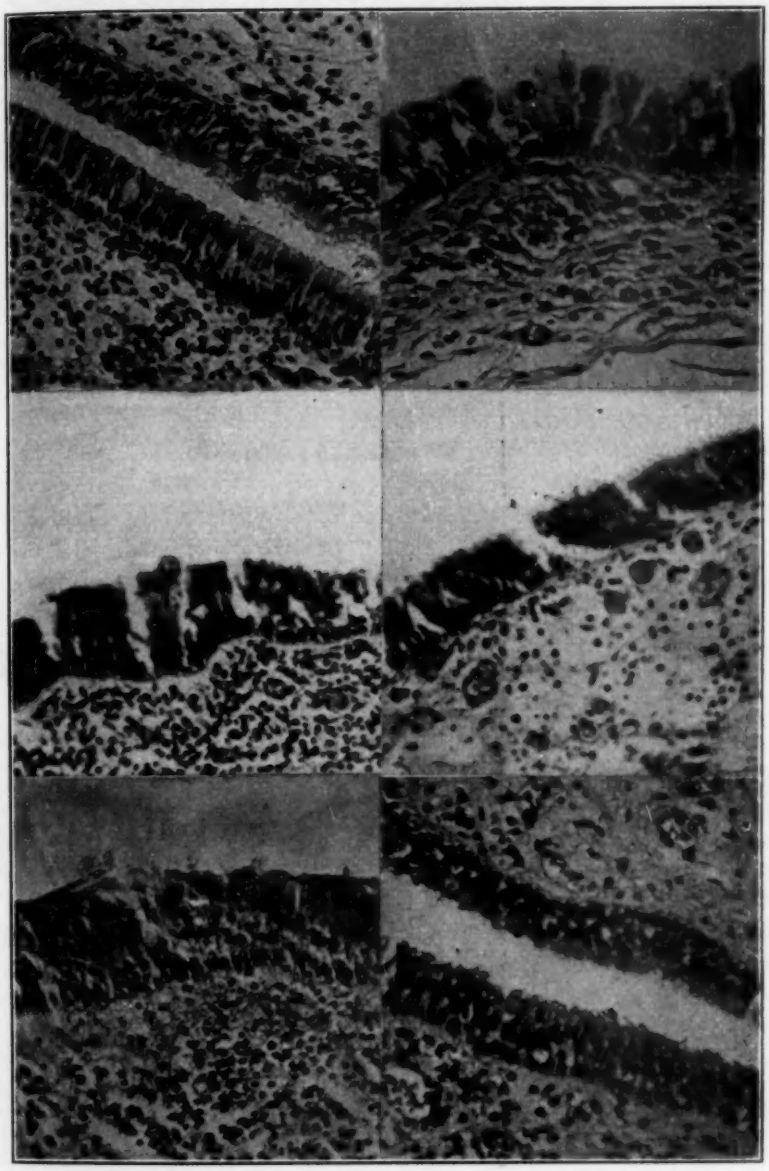

Fig. 14.—Specimens from human antrum, showing regenerated ciliated columnar epithelium. Low power view.

and trauma. In only one small area was epithelium of the stratified squamous type found, and one could not be sure that this piece of tissue was not from the turbinate.

THE METHOD OF REPAIR

The antrum offers an excellent location for regeneration and growth of tissue. It is surrounded by an abundance of blood vessels and nerves, and no sutures or other foreign bodies are required after operation which might interfere with or cut off the blood or the nerve supply to the traumatized area. It provides warmth, moisture, comparative freedom from disturbing currents of air and ample nutrition, and were it not for the presence of infection it would be an ideal place for the growth of new epithelium. As has been said, as early as sixteen days after operation there is definite, unmistakable evidence of the growth of young epithelial cells on the surface of the cavity.

Where, then, does this new epithelium come from?

There is no known exception to the rule that in regeneration epithelial elements develop from the preexisting epithelium. Apparent exceptions are due to the transplantation of living epithelial cells to the granulating surface. When all the epithelium has been removed from the antrum, the epithelium of the nose can readily grow into the antrum, not only from the edges of the intranasal opening but also from the natural ostium and the accessory ostium, if present. Within a few days, a luxuriant growth of healthy granulation tissue is formed, which is composed of young fibroblasts and masses of loops of young budding capillaries waiting to receive and nourish any epithelium.

No matter how carefully or completely the epithelium is stripped from the bone, microscopic patches of connective tissue cells of the periosteum will be attached to the bone, and these will almost immediately begin to proliferate, for connective tissue is the most active of all the regenerating tissues in the body. If necessary, the bone cells could easily revert to the function of forming connective tissue.

Another possible source of regeneration is from the cells that are dislodged from the nasal epithelium every time a sponge or an instrument is put in the nose, not only at the time of operation, but at each subsequent dressing or irrigation. When these cells are transplanted to the antrum, they grow readily and multiply, for their environment is ideal. Transplantation is the most probable explanation for the occasional finding of stratified squamous epithelium in the antrum following operation, for it is frequently found in certain areas of the nose. This would fit in with the claims of those who deny that metaplasia takes place and those who maintain that if areas of squamous epithelium are found these areas have existed as such from the beginning and have undergone no change in type.

It is known that within two hours after the removal or destruction of epidermis, whether of the outer skin, tongue or mucous membrane, the cells of the deeper layers and even the columnar epithelium exhibit definite changes in warm-blooded animals. At the edge of the wound the fully formed columnar cells lose their cilia, become more cubical and ultimately flatten and undergo a translation over the exposed surface. Within twenty-four hours the epithelium surrounding a wound is distinctly thinned and composed of fewer layers, while at its edge a single layer of flattened cells stretches out over the wounded surface.

These marginal cells pass through a cycle of transformation in response to injury. At first they are dedifferentiated into basic cells which multiply by mitosis and migrate over the denuded area. These basic cells have three inherent possibilities locked up within them. They will later specialize into ciliated cells, goblet or secreting cells and supporting cells, and thus the cycle is completed. The inherent cellular possibilities probably respond to environment and necessity and finally exist in a state of balanced relationship. This explains the abundance of goblet cells found in the regenerating epithelium in the antrum before the racemose glands are formed. Cellular differentiation takes place before the whole area is covered, so that the various processes are taking place at the same time. Were it not for the character of the stroma, it might be difficult at times to say just where the new epithelium begins. At first the cells are relatively loosely attached to the underlying granulation tissue, but at a comparatively early date the formation of a definite basement membrane takes place. This is supplied by the fusion of fibrils from the underlying connective tissue. Epithelium, then, is not merely an inert coat thrown over the surface of the body and its cavities for protection, but it is a very live and active tissue.

Denuded areas are rapidly covered by a fibrinous exudate containing many leukocytes, underneath which there is much fibroblastic activity forming a new connective tissue stroma for the regenerating epithelium. This exudate is probably part of the grayish material recovered in washings from antrums recently operated on, and it is removed by the epithelium as it creeps inward. The whole picture is that of a general reparative response to trauma, and while nature repairs injury in excess, this excess is gradually withdrawn as the need for its presence is reduced.

For some reason, excessive granulation tissue is prone to form in some cases. This is commonly seen in surgical intervention on the mastoid. It applies also to the antrum. The amount of infection present is also a factor in the production and reduction of this tissue. Much infection in the adjacent sinuses or reinfection of the new membrane increases granulation and prevents thinning of the stroma. Undue granulation before epithelization is likely to mean a thicker stroma.

Glands.—Basic cells at first compose the regenerating layer of epithelium. These cells soon begin to invaginate into the stroma, and glandular anlagen are formed. Further transformation and specialization take place until the cells are fully equipped to complete their function as mucous-secreting glandular cells. As previously mentioned, Gorham and Bacher saw evidence of the regeneration of glands in the human antrum within four weeks after operation. They were definitely present in the antrum of the dog after five months. They apparently follow closely the formation of new epithelium.

Considering what is known about epithelial activity, it is not logical to assume that nature would leave a cavity such as the antrum void of epithelium. It seems to be her constant care to keep intact the surface covering of the body and the lining of the cavities and channels of the body. Certain factors tend to prevent or interfere with normal healing. Infection may prolong a destructive process or may stimulate excessive granulation, both of which vary the nature of the repair. Excessive trauma and general debilitating diseases also impede reparative processes. Also, people vary in their response to injury. In the cases examined, none of these factors has been sufficient to prevent the regeneration of the preexisting epithelial structures.

Criticism has been made that although the regenerating membrane may appear normal, it may not have regained its normal function. However, little is known about the normal function. The chief functional elements are the surface epithelium with its goblet cells and cilia and the mucous glands in the stroma. One knows that they regenerate, and when they appear normal, the logical assumption is that their function is normal.

CONCLUSIONS

1. Ciliated columnar epithelium and glands regenerate in the human antrum following a radical operation.

2. It probably requires six months for the regeneration to approach normal.

3. Infection does not prevent regeneration, although it may modify its character.

4. Debilitating disease does not prevent regeneration.

5. Regeneration was seen to be considerably advanced as early as sixteen days after operation; it must therefore begin at an earlier date.

Dr. H. P. Mosher gave me the privilege of using twenty-one specimens from antrums and one from a frontal sinus; Dr. Perry Goldsmith, three specimens from antrums, and Dr. George Poirier, one specimen from a frontal sinus.

513 Medical Arts Building.

SINUSITIS IN A SERIES OF ALCOHOLIC HALLUCINOSES*

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Underlying the hallucinosis of alcoholic patients are two factors: first, the patient's personality and emotional motivation; second, toxic and infectious elements. Focal infections have been in doubtful repute as the cause for mental states accompanied by hallucinosis. Sinusitis has come to occupy a prominent position in the literature on focal infections in mental disease because of the apparent ease of lymphatic communication with the brain, because of the existence of localized meningitis due to sphenoiditis, etc. Our attempt in the present study has been to determine whether alcoholic patients with extensive sinusitis are more prone to hallucinations than alcoholic patients who are free from disease of the sinuses.

For diagnostic purposes, we irrigated the sinuses in a series of persons from a large service for alcoholic patients. Practically no discrimination was practiced in selection as the histories especially were found to be unreliable.

A brief summary of our findings is a follows: The sinuses of 144 patients were irrigated for diagnostic purposes. Of these 144, 63, or 44 per cent, had hallucinations. Fifty-nine, or 41 per cent of the 144 showed chronic purulent sinusitis. Thirty, or 51 per cent, of the 59 had hallucinations. Eighty-five, or 59 per cent, of the 144 showed no sinusitis. Of these, 33, or 39 per cent, had hallucinations.

The series with chronic sinusitus contained a larger number of persons with alcoholic hallucinoses than the series free from sinusitis. The difference, however, is not great enough to show that sinusitis and hallucinosis have any noteworthy frequency of association. The type of patients examined have, as a rule, been subject to poor hygienic conditions, which possibly accounts for the high incidence of the disease.

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* Submitted for publication, March 26, 1931.

* From the Department of Hospitals, Division of Psychiatry, Dr. M. S. Gregory, director.

* This represents part of an investigation suggested by Dr. Gregory as to the secondary rôle of chronic infection in certain mental states.

TABLE 1.—*Alcoholic Patients Who Had Hallucinations*

Name and Age	Subjective Mental Note	Objective	Admission Note	Physical and Neurologic	Hemoglobin, per Cent	Blood	Urine	Blood Pressure	X-Ray of Sinuses	Nasal History	Nasal Examination; Treatment
George R. 40	For years at times he keeps drinking until hallucinations occur; is separated from his wife; works only at odd jobs to pick up enough change to drink; unable to name friends interested enough to come in for him	Fireman; after sobered up he is phlegmatic but willing and energetic if he is directed in his tasks	Ran into Harlem Hospital with definite hallucinations but cleared up almost immediately in Bellevue with an amnesia	Good general condition; leukopenia	80	Polymorphonuclears, 31; lymphocytes, 60; eosinophils, 3; transitionals, 6; basophils, 0; white blood cells, 4,200; red blood cells, 4,300,000; Wassermann, negative	Negative; nonprotein nitrogen, 30; sugar, 81	120 78	Pathologic process in left maxillary sinus (hypertrophic mucosa)	Almost constant heavy nasal discharge; six handkerchiefs a day; other complaints slight	Repeated washings from right sphenoid, 1+ pus; ethmoiditis probably present (advanced); dental prophylaxis
John R. 33	Three recent admissions on ambulance calls by his mother; said to have been having hallucinations before admission; ordinarily works fairly steadily; when a blood test was to be made, said "I'd like to ask my mother"; obvious neurotic situation	Painter; after prolonged apprehensiveness became very agreeable and intelligently helpful	Extremely tremulous and apprehensive this time as previously; later said he had been having a cold for a week	Albuminuria gradually lessened; tremors and perspiration improved; roentgenograms made of suspicious teeth	80	Polymorphonuclears, 72; lymphocytes, 22; eosinophils, 0; transitionals, 6; basophils, 0; white blood cells, 9,200; red blood cells, 4,400,000; Wassermann, negative.	Albumin 3+; casts rare; specific gravity, 1.014; nonprotein nitrogen, 30; sugar, 88	150 106	Pathologic process in both maxillary sinuses; more marked on right; polyps in left antrum	Head cold every 2 mo.; uses petrolatum locally; no definite sinus complaints	Right antrum very dark to transillumination; washings from left antrum 1+ mucilaginous material; washings from right antrum negative
Henry B. 44	Has been a drinker all his life; has been in U. S. Veterans Hospital no. 81 as a chronic alcoholic patient; can give no intelligible description of his state of mind that causes him to drink	Handyman; on the ward is agreeable; never heard from; tries to do a little work; content to be by himself	Brought in by ambulance from residence; very shaky later developed fever and transient delirium	Poor physical condition; gradually improved; neuritic signs in legs	80	Polymorphonuclears, 66; lymphocytes, 23.5; eosinophils, 0; transitionals, 10; basophils, 0.5; white blood cells, 8,500; red blood cells, 4,600,000; Wassermann, negative	Negative; nonprotein nitrogen, 35; sugar, 80	112 84	Pathologic process in both maxillary sinuses; more marked on right	Complained of nasal discharge of week's duration; says previous attacks rare, but probably frequent	Considerable nasal secretion; dark to transillumination; washings from both antrums 4+ pus
William M. 54	Always a moderate drinker; this time "I found I couldn't stop"	Bartender; affable, ready to stay for treatment; says his job is waiting for him	Walked in with a friend; later became delirious	Slight edema on admission; hypertension and a high blood sugar	80	Polymorphonuclears, 76; lymphocytes, 24; eosinophils, 0; transitionals, 0; basophils, 0; white blood cells, 11,000; red blood cells, 4,300,000; Wassermann, negative	Negative; nonprotein nitrogen, 36; sugar, 200	182 100	Pathologic process in left maxillary sinus; frontal sinuses rudimentary	Occasional colds; presents a quinsy during this residence	Four plus pus from left floor; washings from left antrum 3+ pus; left antrum dark to transillumination
Milton R. 39	Reasons for drinking not obtainable in present instance; patient has been an alcoholic for years	Laborer; good worker when sober and looks after himself fairly well	Walked in with a friend; later hallucinations; has convulsions	Negative except for slight tremor	70	Polymorphonuclears, 54; lymphocytes, 89; eosinophils, 3; transitionals, 4; basophils, 0; white blood cells, 7,500; red blood cells, 3,600,000; Wassermann, negative	Negative; nonprotein nitrogen, 31; sugar, 80	120 86	Pathologic process of right ethmoid and right frontal sinuses; (hypertrophic mucosa)	Has a cold of 1 month's duration; previous colds once a month	Two plus nasal discharge from middle fossae; washings from antrums returned a large amount of mucus; left sphenoid negative

						white blood cells, 7,500; red blood cells, 3,600,000; Wassermann, negative			(hypertrophic mucosa)	colds once a month	antrums returned a large amount of mucus; left sphenoid negative
Peter H. 48	Regression (?); drinking only 4 years; common law wife left him 5 years ago; denies depressions; further constitutional symptoms not made out	Cook in a speakeasy industrious and energetic	Hallucinosis in Municipal Lodging House; apparently first hallucinosis	Marked hypertension and cardiac hypertrophy	75	Polymorphonuclears, 72; lymphocytes, 23; eosinophils, 1; transitionals, 4; basophils, 0; white blood cells, 7,600; red blood cells, 4,000,000; Wassermann, negative	Sugar, 0; casts, rare; albumin, 2+; specific gravity, 1.014; nonprotein nitrogen, 31; sugar, 100	186 126	Pathologic process on right antrum; probably right ethmoid	Has colds "a whole lot"; hay-fever at 25; no headaches	Mucopurulent discharge from both sides; antrums dark; washings from right antrum 2+; left antrum negative
John C. 48	Original cause for intemperance obscure; episodes of hallucinosis for past 5 years	Laborer; appears childish; probably deteriorated	Brought in on police call; hallucinations	Liver enlarged; suspicion of pyramidal involvement; chest emphysematous; retinal sclerosis	75	Polymorphonuclears, 56; lymphocytes, 35; eosinophils, 1; transitionals, 8; basophils, 0; white blood cells, 8,200; red blood cells, 4,100,000; Wassermann, negative	Albumin, 1+; few hyaline casts; nonprotein nitrogen, 48; sugar, 120	106 88	Pathologic process in both maxillary sinuses; more marked on right	Occasional colds; minimized	Right antrum dark to transillumination; mucoid secretion in nose; washings from right antrum contain shreds
Raymond J. 42	Thinks he drinks because it runs in the family; has lost many positions through drink; for many years has taken an eye-opener	Driller; helpful and cooperative when sober	Walked into hospital reacting to auditory hallucinations (first attack)	Peripheral neuritis of left lower extremity; left pupil fixed; slight retinal sclerosis; vision 6/200	75	Polymorphonuclears, 56; lymphocytes, 39; eosinophils, 2; transitionals, 0; basophils, 3; white blood cells, 12,000; red blood cells, 3,900,000; Wassermann, negative; spinal fluid, negative	No albumin; no casts; specific gravity, 1.012; pus, 2+; nonprotein nitrogen, 45; sugar, 80	126 74	Pathologic process in both maxillary sinuses	Frequent colds	Mucoid secretion in nose; left antrum dark to transillumination; sphenoid washings 2+; washings from left antrum 1+
William P. 40	Original cause for drinking undetermined; since 24 has been swearing off continually; single; "never bothered" with women since 35	Formerly a bartender; anxious to be helpful	Found with hallucinations at Municipal Lodging House	Neuritis of left upper extremity; liver enlarged; slight retinal sclerosis	90	Polymorphonuclears, 60; lymphocytes, 38; eosinophils, 2; transitionals, 0; basophils, 0; white blood cells, 11,000; red blood cells, 4,800,000; Wassermann, negative	Negative; nonprotein nitrogen, 30; sugar, 80	132 84	Hypertrophic mucosa both antrums; pathologic process in both ethmoids	Frequent severe colds	Three plus mucopurulent discharge; antrums dark to transillumination; washings of antrums 3+ old pus; sphenoids 1+
William B. 42	Original cause for drinking undetermined; patient not interested or critical for history	Roofer; probably shiftless for years; still has some slight initiative	Picked up as a case of bronchitis; later became delirious	Tremulous; slight atrophy of muscles of calf; old retinitis; has recovered from bronchitis	85	Polymorphonuclears, 55; lymphocytes, 43; eosinophils, 0; transitionals, 0; basophils, 2; white blood cells, 5,100; red blood cells, 4,600,000	Casts, +; few white blood cells; albumin, large trace; specific gravity, 1.008	120 90	Antrums show hypertrophic mucosa	Mild colds; minimizes symptoms	Four plus purulent discharge; pansinusitis; old broken down pus
Fred H. 45	Original cause for drinking undetermined; first drank too much 5 years ago; no associations with women for 10 years	Formerly a bartender; cooperative but unable to plan ahead	Picked up; hallucinations on admission suggestive of schizophrenia; recovered	Negative	90	Polymorphonuclears, 73; lymphocytes, 26; eosinophils, 1; transitionals, 0; basophils, 0; white blood cells, 8,000; red blood cells, 5,000,000	Negative; nonprotein nitrogen, 36; sugar, 83	142 86	Pansinusitis	Occasional mild cold (minimizes)	Two plus mucopurulent discharge on both sides; obstruction left side; antrum washings 4+ broken down pus

In the cases considered positive for disease of the sinuses pus was found on repeated washings. All were positive on roentgen examination; in many of them thickening of the mucosa was also seen in subsequent roentgenograms taken with iodized poppy seed oil 40 per cent in situ. While there are no acute cases of fulminating sinusitis in this series, it was felt that in the chronic purulent types, exacerbations would be frequent enough to point to any noteworthy effect to be expected in the acute types. Pictures made with iodized oil were particularly helpful in showing the condition of the sphenoid sinuses.

Fig. 1.—Roentgenogram in a case of pansinusitis. The thickened linings of the antrum are demonstrated by iodized oil.

Detailed physical examinations were made in 41 of the 59 cases of diseased sinuses, and the results have been listed herewith. Many persons with hallucinoses show arterial degeneration and other constitutional disease. Fully 75 per cent of the arteriosclerotic cases in this restricted group showed hallucinosis as contrasted with about 50 per cent for the whole group. This somewhat arbitrary comparison was made in other groups as follows: Eight of the 41 patients with cases of chronic

sinusitis showed marked cardiovascular disease; of these 6, or 75 per cent, showed hallucinoses. Five showed enlargement of the liver; of these 3, or 60 per cent, showed hallucinoses. Seven had peripheral neuritis; of these 5, or 71 per cent had hallucinoses. Nephritis without retention of nitrogen occurred in 12 patients, 7, or 58 per cent, of whom showed hallusinoses. Cases of alveolar abscess (chronic), in which extraction was required, occurred in 7 patients, 2, or 29 per cent, of whom showed hallucinoses. There were nine cases in which sphenoiditis was the most conspicuous involvement; 5 of these patients, or 56 per cent, showed hallucinoses. Hallucinoses also occurred in 6, or 50 per cent, of 12 cases of lymphocytosis and in 2, or 40 per cent, of 5 cases of optic neuritis.

Fig. 2.—A polyp is shown in the purulent sphenoid sinus by means of iodized oil.

We do not believe that any additional conclusions can be drawn from the foregoing associations. There were only 2 cases in which changes were found on chemical examination of the blood. One showed retention of nitrogen, and the other showed hyperglycemia. Both of these were cases of hallucinosis.

A note as to each patient's personality is appended, but classification is not practicable at this time, although probably a major factor in the determination of the hallucinosis. There is often an obviously large schizoid element in the personality, which under the influence of alcohol manifests itself by projections in the form of hallucinosis. Many inveterate alcoholic persons do not have hallucinations. These might

TABLE 2.—*Alcoholic Patients Who Have not Had Hallucinations*

Name and Age	Subjective Mental Note	Objective	Admission Note	Physical and Neurologic	Hemoglobin, per Cent	Blood	Urine	Blood Pressure	X-Ray of Sinuses	Nasal History	Nasal Examination; Treatment
Thomas F. 50	For years apparently drinks till he collapses physically; lives in Bowery hotels; cardiorenal anxiety does not seem to be definite enough to be a possible cause; on alcoholic ward 2 years ago; apparently emotionally a a casual worker	Laundry work; agreeable but no initiative; apparently accustomed to being in poor physical condition; slightly deteriorated (?)	Voluntary admission as previously; apparently has never had hallucinations	Improved rapidly; chest emphysematous; asthmatic breathing; left border of heart only slightly extended	85	Polymorphonuclears, 68; lymphocytes, 29; eosinophils, 1; transitionals, 2; basophils, 0; white blood cells, 10,100; red blood cells, 4,200,000; Wassermann, negative	Specific gravity, 1.020; albumin, +; casts, +; nonprotein nitrogen, 37; sugar, 92	152 98	Pathologic process in left maxillary sinus (cyst ?)	Nasal discharge on admission of about 10 days' duration; left obstruction and frontal headache; frequent head colds and history of possible sinusitis	Sphenoids irrigated, 1+; right antrum irrigated; mucoid material obtained
Edward J. 52	For years has been failing physically and drinking whenever the opportunity offers; works only enough to get a few cents to buy another drink; confused throughout his stay in Bellevue; former employer could give no address of supposed wife or other relatives	Remained confused under 2 weeks' observation; probably deteriorated; mechanic	A neighbor sent him to Manhattan Eye and Ear Hospital because of an alcoholic amblyopia; transferred to Bellevue because obviously psychotic	Condition poor; confused; impaired vision; also retinal sclerosis; pupils fixed to left; react in accommodation; chest emphysematous; feeble and tremulous	90	Polymorphonuclears, 80; lymphocytes, 16; eosinophils, 1; transitionals, 3; basophils, 0; white blood cells, 8,800; red blood cells, 4,900,000; 1st Wassermann, 1+; 2d Wassermann, 2+; spinal fluid Wassermann, negative; colloidal gold curve, 0010000000; no cells or globulin	Negative; nonprotein nitrogen, 32; sugar, 85	100 74	Left pansinusitis	Unreliable; frequent colds; six handkerchiefs a day	Left antrum dark; pus in middle meatus; sphenoid washings contained mucopus 1+; seven upper teeth extracted
John D. 32	Drinking "because out of work"; has been drinking moderately since adolescence; no previout admissions	Orderly; when clear is an energetic, willing worker; no spontaneous complaints; content to await treatment as indicated	Walked into psychopathic admitting office; restless and talkative; lost his nervousness after 2 nights' sedation; injured shoulder before admission	Negative except for history of previous alcoholic neuritis	80	Polymorphonuclears, 60; lymphocytes, 36; eosinophils, 4; transitionals, 0; basophils, 0; white blood cells, 6,900; red blood cells, 4,400,000; Wassermann, negative	Negative; nonprotein nitrogen, 35; sugar, 92	138 90	Pathologic process in left maxillary sinus	Nasal discharge of 2 weeks' duration; frontal headaches (?); colds quite often	Four plus mucopurulent discharge middle fossae; washings from both antrums 1+ mucopus; two upper bicuspids extracted
Charles G. 30	May drink to compensate for a deforming kyphoscoliosis; attempted to enter girl boarders' rooms while on a 2 weeks' drunk	Does odd jobs; is extremely anxious to please; suggestible; develops new complaints; wants larynx examined to improve singing voice	Unsteadiness only objective symptom on admission; brought in by ambulance from residence	Negative except for old deformity of thoracic spine	75	Polymorphonuclears, 74; lymphocytes, 24; eosinophils, 1; transitionals, 0; basophils, 1; white blood cells, 7,500; red blood cells, 4,150,000; Wassermann, negative	Negative; nonprotein nitrogen, 33; sugar, 78	132 92	Pathologic process in left maxillary sinus	No present complaints; occasional cold; picked up because of dark transillumination	Two plus mucopurulent both middle fossae; repeated washings both antrums 1+ pus

Frank M. 54	Drinks because depressed; is an actor out of work 5 years	Pleasant, affable, cooperative; depressed; possibly deteriorated	Brought in after having jumped out of a window; did not have hallucinations	Chest emphysematous; signs of arteriosclerosis; otherwise negative, except for fractured ulna	85	Polymorphonuclears, 70; lymphocytes, 24; eosinophils, 2; transitionals, 4; basophils, 0; white blood cells, 7,100; red blood cells, 4,550,000; Wassermann, negative	Negative; nonprotein nitrogen, 36; sugar, 88	... ..	Slight pathologic process of right maxillary sinus	Repeated attacks of obstruction and catarrh; no headaches	One plus discharge both sides; washings from right antrum broken down pus 2+; sphenoids clear
Frederick B. 40	Over 50 admissions to alcoholic ward; history unreliable	Laborer; deteriorated (?); no hallucinosis	Ambulance case; irritable and resistive first few days	Negative	80	Polymorphonuclears, 76; lymphocytes, 24; eosinophils, 0; transitionals, 0; basophils, 0; white blood cells, 6,700; red blood cells, 4,600,000; Wassermann, negative	Negative; nonprotein nitrogen, 35; sugar, 92	130 96	Slight pathologic process of both maxillary and left ethmoid sinuses	Unreliable	Selected because left antrum dark; 1+ nasal discharge middle fossae; left antrum washings contain broken down pus; left sphenoid mucopus 2+; right antrum shreds
John H. 59	Probably drinks because deteriorated; here 2 years ago; has been having convulsions	Exbaker; judgment permanently impaired; no hallucinosis	Brought in by son who has been supporting him; confused after convulsions	Signs of arteriosclerosis	75	Polymorphonuclears, 81; lymphocytes, 13; eosinophils, 2; transitionals, 3; basophils, 1; white blood cells, 11,000; red blood cells, 4,200,000; Wassermann, negative	Negative; nonprotein nitrogen, 32; sugar, 90	142 94	Pathologic process in both maxillaries (hypertrophic mucosa)	No complaints; history unreliable	Nasal discharges 1+ middle fossae; right antrum washings broken down pus 2+; right sphenoid washings clear; left not accessible
William M. 57	Originally was hypersensitive to small amounts of alcohol; only for past 8 years has taken too much; never squandered household money on drink	Steamfitter; willing and cooperative; physically incapacitated	Walked in alone; wants a home	Vision 12/200; old neuroretinitis; liver enlarged; slight edema of feet	70	Polymorphonuclears, 44; lymphocytes, 53; eosinophils, 0; transitionals, 3; basophils, 0; white blood cells, 6,000; red blood cells, 3,800,000; Wassermann, negative	Albumin, very faint trace; nonprotein nitrogen, 32; sugar, 125	128 78	Both antrums show hypertrophic mucosa; pathologic process in right frontal sinus	"Terrible colds," for years; no definite sinus headaches	Mucopurulent discharge in nose; left antrum dark to transillumination; both antrum washings 2+; left frontal washings 1+
Charles A. 55	Original cause for drinking not determined; since 19 has always been told that he drinks too much; never married	Janitor; willing and agreeable	Picked up at his home, confused	Peripheral neuritis left extremity; old retinitis	70	Polymorphonuclears, 27; lymphocytes, 68; eosinophils, 2; transitionals, 0; basophils, 3; white blood cells, 6,500; red blood cells, 3,950,000; Wassermann, 1+; spinal fluid, negative	Negative; nonprotein nitrogen, 32; sugar, 90	120 80	Pathologic process in both antrums and right frontal sinus	Occasional mild colds	Two plus mucopurulent discharge; antrums dark to transillumination; right antrum washings 2+; sphenoids clear

be expected often to be manic-depressive types; this fact, however, is not readily demonstrable. As an example of the difficulty in obtaining accurate information from these patients, we might state that we find that not more than 1 or 2 in the entire 144 could give any recognizable history of acute attacks of sinusitus.

In the literature of the past ten years there are comparatively few rhinologists who claim to attribute to sinusitis any rôle in the production of hallucinosis greater than would be played by other acute infectious or toxic agents. Most rhinologists undoubtedly see hypochondriacal types of patients with numerous somatic complaints because patients so constituted tend to present themselves to physicians for relief. Of

Fig. 3.—Purulent antrum with defect in filling.

our patients, not even those with most severe cases of pansinusitis have had any complaints referable to disease of the sinuses.

French [1] cited the cases of two patients with disease of the sinus from a mental sanatorium. The first heard devils telling her to kill herself. Two years after operation on the sinus she had recovered. She had had a depression twenty-five years previously, and most psychiatrists would doubt whether she might not have recovered without the operation.

French's second patient was operated on two months after the onset of agitation; she was discharged improved five months later,

1. French, J. G.: Infection of Nasal Sinuses in Relation to Insanity, Lancet **2**:13 (July 2) 1927.

and had lost all mental disorder after another year. There was no hallucinosis.

Adam [2] mentioned a patient having spheno-ethmoiditis. At the time of an operation in 1921 there were delusions of persecution. In 1925, the delusions were more pronounced. This patient died shortly afterward; necropsy was not performed. Incidentally, the cribriform plate had been fractured at the time of operation.

In a second case of Adam's, one of depression, the patient remained in a mental institution unimproved although pus had disappeared after sinusectomy performed three years before.

Fig. 4.—The sphenoids and antrums are clinically negative.

Gatewood [3] mentioned a case of sinusitis in which operation was performed after three months of "questionable delusions," with immediate mental improvement and later complete recovery with an amnesia for the operation. A second case was suggestive in that it occurred three weeks postpartum. The patient was comatose; operation was performed without anesthesia, and mental recovery resulted in four weeks.

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2. Adam, J.: Chronic Nasal Sinusitis with Mental Symptoms, Brit. M. J. **2**:794.

3. Gatewood, E. T.: Acute Toxic Encephalitis of Nasal Sinus Origin, J. A. M. A. **84**:1473 (May) 1925.

Watson-Williams [4] referred to cases of a similar nature. A more general attitude, however, seems to be that of Wilson,[5] who is skeptical as to the major part which sinusitis and other focal infections may play in the production of mental disorder.

Yates [6] expressed the belief that with chronic sphenoiditis, the destruction of the ciliary lining favors direct absorption with the production of encephalitis. Druss [7] said that a persistent Rathke's pouch may transmit toxins.

Graves and Pickworth [8] suggested that vegetative disorders may be due to absorption from chronic sphenoiditis. Bohan [9] cited cases of transient hemiplegia in which the only ascertainable pathologic process was in the sinuses. Alden [10] described an amnesia of one year's duration which showed the first improvement two days after an infected antrum was opened.

The cases cited are of many types. As mentioned, some of them may have been self-limiting, and the operation on the sinus was of no particular effect. A primary sinusitis can no doubt cause a mental state of stupor or delirium, but it seems likely that evidence of septicemia, abscess of the brain or meningitis is to be expected with the progression of such mental symptoms.

CONCLUSIONS

1. In a series of chronic alcoholic patients with purulent sinusitis, there did not appear to be any relation between the sinusitis and hallucinosis.

2. Of 144 chronic alcoholic patients, 59 had chronically infected sinuses. Of these, the number who remembered having acute headaches caused by sinusitis was negligible.

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4. Watson-Williams, P.: Chronic Nasal Sinusitis and Its Relation to General Medecine, New York, William Wood & Company, 1930.

5. Wilson, George: Role of Focal Infections in Production of Nervous and Mental Diseases, Brit. J. Dent. Sc. **73**:161 (Dec.) 1928.

6. Yates, A. L.: Treatment of Encephalitis Lethargica by Removal of Possible Etiological Factors, Brit. M. J. **1**:714 (April) 1927.

7. Druss, J. G.: Intracranial Complications Associated with Disease of Sphenoid Bone, Arch Otolaryng. **10**:39 (Oct.) 1929.

8. Graves, T. C., and Pickworth, F. A.: Sinusitis in Etiology of Mental Disorder, J. Laryng. & Otol. **43**:545 (Aug.) 1928.

9. Bohan, P. T.: Hemiplegia, with Recovery, Probably due to Sinusitis, M. Clin. North America **7**:1075 (Jan.) 1924.

10. Alden, A. M.: Psychosis Associated with Disease of Nasal Accessory Sinuses, Laryngoscope **34**:126 (Feb.) 1924.

Clinical Notes

EPIDURAL ABSCESS OVER THE TIP OF THE PYRAMID, WITH SYMPTOMS OF THE FIFTH AND SIXTH NERVES

Report of Two Cases *

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CASE 1.—T. R., a boy, aged 10 years, was seen on March 7, 1930, with an inflammation around the scar left by a simple operation on the right mastoid, which I had performed eight years previously. Three days later the scar was reopened at the lower angle, and the mastoid cavity was drained. As this simple procedure did not prove sufficient, on March 22 a secondary operation on the mastoid was performed. While the patient was in the hospital, he complained of a severe, paroxysmal right frontal pain. At first the attacks of pain were about six hours apart; gradually the interval became shorter. An effort to obtain relief by the use of sedatives was made.

Ten days after the secondary operation on the mastoid, the pain was increasing, and the patient began to complain of double vision with the right eye. He did not show strabismus. During the next week, his temperature did not exceed 100 F. At the solicitation of the mother, and on her promise to keep the child in bed, he was allowed to leave the hospital on April 7.

In the middle of May, seven weeks after the secondary operation on the mastoid, the pain had assumed intolerable proportions. The patient was so much distressed by the paroxysms that during them he became irrational, and rolled on the floor in extreme agony. On May 13, he returned to the hospital, where an operation was performed.

The simple operation on the mastoid was converted into a radical procedure. When this was completed, a careful inspection of the cavity was made, which revealed the presence of two small sinuses on the floor of the aditus, directly above the horizontal semicircular canal. When a probe was inserted into these sinuses, it met with soft, nonresistant tissue. The bone forming the tegmen antri and the tegmen tympani was removed down to a line parallel with the sinuses. The brain in the area denuded of bone was then elevated from the floor of the middle fossa; a dressing forceps was inserted in a downward, forward and inward direction, hugging the anterior surface of the petrous portion of the temporal bone. At a distance of a little more than an inch, the forceps entered a cavity containing pus, which ran out along the blades of the instrument, the quantity seemingly being about 2 drachms (7.8 Gm.). A small rubber catheter was then placed in the wound. The drain was sewed in situ, left for two weeks and then removed. After

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* From the Department of Otology, New York Post-Graduate Medical School and Hospital.

the pus was liberated at the second operation, the pain subsided, soon disappearing completely. Double vision was not noticed again. On July 1, plastic work was done on the wound, and it then healed satisfactorily.

It was apparent that the small sinuses noted in the aditus were the avenues of exit for the pus, which came from an epidural abscess in the location of the apex of the petrous pyramid. The pressure of the abscess on the gasserian ganglion and the sixth nerve produced the symptoms of pain and double vision.

Case 2.—Francis H. B., aged 24, when admitted to my service at the Post-Graduate Hospital on Oct. 29, 1930, had double, chronic, purulent otitis media; there had been a discharge from the left ear for fourteen years, and from the right ear for three years. He complained of having had severe pain in the left ear and in the occipital region for the past five days, accompanied by dizziness, vomiting, daily chills and high fever, a marked decrease in hearing in the left ear and double vision in the left eye. On admission to the hospital, his temperature was 106 F. On examination, a profuse purulent discharge was found on the left side and a mucoid discharge on the right. Both ear drums had almost completely disappeared, and the middle ears seemed to be full of granulations. Hearing on the left side was limited to the hearing of a shout; on the right it was considerably better. There was slight tenderness over the left mastoid. A spontaneous nystagmus to the left was noted; there was no strabismus or meningitic symptoms.

A radical operation was promptly performed on the left mastoid. It was found that the roof of the tympanum and of the mastoid was severely necrosed, with an exposure of the dura. This necrotic bone was cleared away, which left a wide exposure of the dura. The organisms from the wound proceed to be Streptococcus haemolyticus and Bacillus proteus.

After the operation, the temperature dropped, and thereafter during the course of the illness was never higher than 102 F. The patient's condition was at first fairly comfortable, all of his symptoms improved, and his ability to sleep returned; however, the occipital pain and diplopia persisted. At first the pain was not severe, but gradually it became so, and by the seventh postoperative day it was so violent that he had to be kept continually under the influence of sedatives.

During this interval, he was watched carefully; his eyes were examined, and nothing abnormal was found; the neurologic examination showed no evidence of an abscess of the brain or of meningitis.

The symptom of frequent vomiting was now added, and the occipital pain became so severe that the patient became irrational at times.

On November 7, the ninth postoperative day, I determined to open the wound and explore the adjacent area in an endeavor to relieve the symptoms. In view of the persistent diplopia and of the severe occipital pain, I thought it possible that there might be a collection of pus in the region of the apex of the petrous pyramid. The patient was again brought to the operating room, the wound was reopened, the brain was elevated from the superior surface of the petrous pyramid, a blunt instrument was passed along the bone in the direction of the apex, and an abscess was opened, liberating about 30 cc. of foul-smelling pus. A rubber drain was then placed in this area and sewed in situ. The operation was completed at 3:45 p. m. I saw the patient about 5 o'clock, and by that time he had reacted and was feeling relieved from pain. The house surgeon saw him that evening at 9, when his condition apparently was satisfactory. Alarming symptoms ensued at midnight, however, and he died suddenly, apparently from an embolus. Unfortunately, autopsy was not obtained.

2 East Fifty-Fourth Street.

A MENINGOCELE WITHIN THE MIDDLE TURBINATE DISCOVERED DURING AN OPERATION ON THE ETHMOID, RESULTING IN MENINGITIS AND RECOVERY *

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This case is reported in order that a rare anatomic anomaly in intranasal anatomy will not go unheeded, and to add one more topic to the long list of hazards frequently encountered in performing operations on the ethmoid.

The presence of a meningocele within the middle turbinate is a rare finding, as is proved by the fact that meningocele has not been found in any of the middle turbinates that have been sacrificed over a period of many years. An endeavor has been made to find the report of a similar case, but in a search of the literature on meningoceles, I have been unable to discover any reference to meningoceles in the ethmoidal region.

As an explanation of the method of development of the meningocele in the case to be reported, two theories present themselves: 1. Owing to the long-standing disease of the ethmoid, the roof of the ethmoid was gradually absorbed, leaving the dura exposed, and in time the dura was forced downward into the ethmoid and middle turbinal. However, it would require an increased intracranial pressure to produce this downward development, and I do not believe that increased pressure was present. 2. That the meningocele was present at birth, resulting from a congenital absence of the roof of the ethmoid which allowed the dura to descend. It is an established fact that the ethmoid cells and the middle turbinals are well developed at birth, which would seem to preclude later evolution.

W. E. Dandy [1] reported the case of a patient with a meningocele that protruded into the orbit. He stated that this case was due to a congenital defect in the roof of the orbit, which he corrected by means of an implant of bone.

REPORT OF CASE

Mr. A. G., aged 44, had been attending the clinic at the Brooklyn Eye and Ear Hospital for eight weeks. He complained of headaches and bilateral nasal discharge. Intranasal examination revealed both nasal cavities to be filled with polypi and pus. There was a marked deviation of the septum to the left.

On May 1, 1929, a submucous resection was performed together with the removal of the nasal polypi on both sides. Following this procedure, there was a moderate improvement, but the nasal discharge still continued. At this time, roentgen examination showed definite involvement of both ethmoid and sphenoid sinuses.

On June 13, the patient was again admitted for a bilateral operation on the ethmoid. It was noted that the anterior tip of the left middle turbinate was markedly enlarged and hard, characteristic of cystic turbinals. With the patient under local anesthesia, the anterior end of the left middle turbinate was freed

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1. Dandy, W. E.: An Operative Treatment for Certain Cases of Meningocele (or Encephalocele) into the Orbit, Arch. Ophth. **2**:123 (Aug.) 1929.

from the base, and an incision was made with nasal scissors at the base for a distance of ½ inch (1.27 cm.). The anterior tip was then removed with a nasal snare. Immediately, there was a moderate flow of bloody fluid from the left naris. At this stage it was thought that a mucocele had been entered, until intranasal examination revealed the following.

At the base of the middle turbinate, from which the anterior tip had just been removed, could be seen a glistening grayish-white membrane, the size of the head of a safety match. In the center of this membrane was found a small perforation through which clear cerebrospinal fluid was escaping. Examination with a probe showed the glistening membrane to be dura extending well back into the middle turbinate. For obvious reasons, the operation was discontinued. The left naris was packed with iodoform gauze, and the patient returned to bed. A few hours later the pack was removed, as it did not control the flow of cerebrospinal fluid, and it was thought that free drainage would be more prone to prevent a meningeal infection.

The following day the patient was drowsy, refused medication and complained of a marked frontal headache. The temperature was 102 F.; the pulse rate, 80. There were slight rigidity of the neck, a suggestion of a Kernig sign and no clonus or Babinski sign. Cerebrospinal fluid was still escaping from the left naris.

On June 15, two days after operation, there was definite rigidity of the neck, but no paralysis of the cranial nerves; the temperature was 103 F.; the pulse rate, 84, giving a general picture of localized meningitis. The discharge of cerebrospinal fluid had stopped.

On June 16, both nerve heads showed slight swelling. At this time, the spinal fluid gave a cell count of 2,800. A culture did not show a growth in forty-eight hours. The patient's condition was about the same until June 19, when the temperature was 104 F.; he was unable to swallow. Rectal feeding was instituted. At this stage, an involvement of the sixth, seventh, eighth and ninth cranial nerves was found on the left side, with a general muscular weakness of the left side of the body. The spinal fluid cell count was 6,000; a growth was not found.

On June 20, a slow but definite improvement began.

On June 25, twelve days after operation, the local signs of the paralysis of the sixth, seventh, eighth and ninth cranial nerves were gradually disappearing. The muscular weakness on the left was unchanged. From then on the patient's condition gradually improved. He was discharged from the hospital on July 24. At this time, intranasal examination showed the left nasal cavity free from polypi. The middle turbinate was healed.

I have examined this patient frequently since his discharge from the hospital, and at the time this article was written there was a regeneration of polypi on both sides. The muscular weakness on the left still persisted.

COMMENT

A perforation was not made through the roof of the ethmoidal region, and an injury of this type did not occur. Surgical procedures other than the amputation of the tip of the middle turbinate with scissors and snare, as stated, were not carried out. There is a possibility of a similar condition in the right ethmoidal area.

307 Sterling Place.

A RETRACTOR FOR USE IN RADICAL OPERATION ON THE ANTRUM*

H. H. Amsden, M.D., Concord, N. H.

In the radical operation (Caldwell-Luc) for maxillary sinusitis, it is necessary to make a large permanent opening in the naso-antral wall in the inferior meatus; the complete removal of bone and mucous membrane is essential for this end. The more cleanly this can be done with a minimum of rasping and trauma, the better and more permanent the end-results will be. I have found the following procedure of distinct value.

The usual incision over the canine fossa is carried to the median line, and the periosteum is elevated to and around the lower border of the pyriform opening, as in the Denker operation. The mucosa and periosteum are then elevated from the inferior meatus, down to the floor, up to the attachment of the lower turbinate and as far back as it is desired to carry the removal of bone. A small, flexible, flat retractor is then introduced into the pyriform opening and bent upward so as to be self-retaining, and also to retract the lip. This obviates the necessity of using two retractors for the soft tissues. The bone of the canine fossa is then removed with a chisel and punch, the interior of the antrum is explored, and the mucosa is curetted or removed, as the operator deems best. The mucous membrane of the naso-antral wall is incised and elevated, and a large flap is removed with a knife or scissors. The bone of the naso-antral wall is then resected with a chisel and forceps, working against the retractor in the pyriform opening; this renders it easy to remove the bone over as wide an area as is desired without lacerating the mucosa on the nasal side. After resection of the bone is completed, the retractor is removed, a probe or small elevator is introduced into the inferior meatus, and the mucous membrane can then be removed clean with a knife or scissors. A piece of 21 gage sterling silver plate, about ¼ inch (0.64 cm.) wide and 3 inches (7.6 cm.) long, makes a satisfactory retractor.

The retractor, two-thirds actual size.

5 South State Street.

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A NEW SHIELD FOR THE EYES AND FOR EYEGLASSES*

Samuel L. Lemel, M.D., Cleveland

Most laryngologists, especially those who do bronchoscopy, have at some time felt the need of suitable protection for the eyes during such procedures as bronchoscopy, intubation and tonsillectomy. Therefore, many have adopted the use of plain glass eyeglasses. The serious disadvantage of these eyeglasses is that they

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become easily soiled by secretions and blood that the patient coughs up. Under such conditions eyeglasses become very annoying, as they must repeatedly be removed and cleansed. Furthermore, the ordinary glasses are too small to protect the eye adequately. This is the experience of operators who ordinarily wear correcting lenses.

Fig. 1.—Showing operator wearing the new shield for eyes and eyeglasses. The disks are protected by a bakelite cover which prevents the soiling of the plate anywhere but in the one field in use.

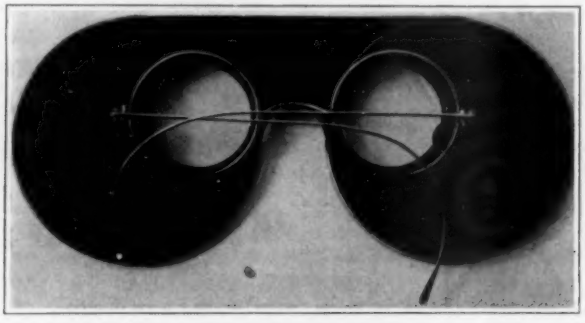

Fig. 2.—Photograph of the shield, which consists of two large revolving glass disks mounted on ordinary spectacle frames.

An attempt to overcome one of the foregoing difficulties has been made by the use of a revolving glass plate suspended from a headband. Because of its size and revolving character, this mask should provide several available clean fields. However, as its surface is entirely unprotected, the whole plate is often soiled at once. This disk has other disadvantages. As it suspended from a headband it cannot be used in conjunction with a head-mirror or a head-light. Furthermore,

it is made to cover only one eye, so that its field of use is much restricted, and if in the course of any procedure it becomes necessary to use the other eye, the mask must be shifted to the other side.

All of these difficulties have been overcome and new advantages incorporated in the new shield for the eyes and eyeglasses that I have devised. This new mask consists of two large revolving glass disks mounted on ordinary spectacle frames. As shown in the photographs, these disks are protected by a bakelite cover, which prevents the soiling of the plate anywhere but in the one field in use. Thus the operator has at least five clean areas available for each eye. The disks have milled edges which project for about 1 mm. beyond the protecting cover and are so mounted that it is a simple matter to turn them.

The spectacle frames behind the disks allow for the introduction of any correcting lenses that the operator may ordinarily wear.

In addition, the shield is so constructed that a gauze or celluloid mask for the nose and mouth can be suspended from the two small bolts seen on the front of the shield.

The whole apparatus is easily taken apart for cleansing by removing the two bolts just mentioned.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

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THE PARANASAL SINUSES

REVIEW OF THE LITERATURE FROM OCT. 1, 1929, TO DEC. 31, 1930

D. CAMPBELL SMYTH, M.D.

BOSTON

This review covers a survey of almost 600 articles written since October, 1929. It is gratifying to note that more is being written on the pathology, embryology and bacteriology of the sinuses. The maxillary antrum, as usual, is the sinus about which most is written. More and more attention is being paid yearly to the importance of the pulmonary complications due to infection of the upper respiratory tract.

ANATOMY, PHYSIOLOGY AND EMBRYOLOGY

Fiol has made an extensive research into the anatomy of the accessory sinuses. His articles are richly illustrated with drawings, photographs and x-ray plates of dissections and bones. His conclusions are as follows:

A. Relating to the Maxillary Sinus

1. The maxillary sinus does not open directly into the nasal fossa but into the oval foset, and in this way it communicates at the same time with the nasal fossa and with the antero-external group of ethmoidal cells.

2. The maxillary sinus can be in direct communication with the frontal sinus. This communication is independent of the classic anatomic arrangement in the outer wall of the nasal fossa.

3. The orbital prolongation of the maxillary sinus must not be confused with the structures of the oval foset. The first is antero-external and the second is postero-internal to the lacrimonasal duct.

4. The relationship of the maxillary sinus to the lateral mass of the ethmoid is that of simple vicinity or contiguity in its posterior part and of direct communication in its anterior part.

5. The clinical relation of the maxillary sinus to the ethmoid and the frontal sinus, which today is supposed to be possible only through the nasal fossa, is in reality also direct.

B. Relating to the Ethmoid

6. The ethmoidal cells do not all open into the nasal fossa.

7. The cells of the antero-external group, that is, the cells of Mouret which surround the lacrimonasal duct, open into the maxillary sinus through the maxillo-ethmoidal duct and the oval foset.

8. The root of the unciform process above and the process itself form a bony plate which isolates this group of cells from the nasal fossa.

9. The investigations confirm the present ideas on the development of the ethmoid and the origin of the frontal sinuses.

C. Relating to the Frontal Sinus

10. The frontal sinus, whether single or multiple, can be in direct relation not only with the nasal fossa, but also with the maxillary sinus.

11. The communication of the frontal sinus with the exterior (that is, with the nasal fossa or the maxillary sinus) always takes place across the ethmoid, principally by the cell the expansion of which formed the frontal sinus in whole or in part.

12. When the origin is entirely from an uncinate cell, a frontal sinus may communicate only with the maxillary sinus.

13. The communication of the frontal sinus with the uncinate group of cells, in the majority of cases in which it exists, is very distinct. It is generally situated in the antero-external part of the fundus of the sinus, in a depression named by the author the maxillary depression.

D. Relation to Structures Described by the Author for the First Time

14. The oval foset communicates externally and below with the maxillary sinus, above and behind with the nasal fossa through the maxillary canal and above and in front with the ethmoid through the maxillary ethmoidal duct.

15. The r[illegible] ethmoidal duct places the oval foset in communication with the antero-exte[illegible] ethmoid.

16. These structures are all outside the unciform process.

E. Relating to the Correction of Some Classic Conceptions

It is usually supposed that each diverticulum from the nose is independent.

17. It has been shown that the maxillary sinus and the frontal sinus can communicate; in reality, they often do so.

18. It has also been shown that a whole region of the ethmoid communicates directly with the maxillary sinus, and only by this means with the nasal fossa.

19. The frontal sinus can communicate at the same time with the nasal fossa and the maxillary sinus; sometimes, only with the latter.

Neivert reviewed the surgical anatomy of the maxillary sinus and brought out some points that it would be well to remember from the surgical point of view; namely, in taking down the inferior nasal wall, one should be careful about the lower posterior angle lest the posterior palatine artery be injured. At times the posterior palatine canal makes a marked curve forward before reaching the palate. In operating on the canine wall, one should avoid the inferior orbital nerve and the dental plexus by making a small hole, as is consistent with good surgical procedures.

Schaeffer has also given a review of the surgical anatomy of the ethmoid, stressing important points from the clinical point of view. He stated as follows:

The many and varied morphologic factors connected with the paranasal sinuses complicate the clinical problems, Not only are the conventional anatomy and the relations of the paranasal sinuses important; the many departures of all the sinuses and cells from the so-called type and the many extramural extensions of the ethmoidal labyrinth in an overlap with the other sinuses frequently become problems in diagnosis and treatment. These conditions justify the leaders in the rhinological field in demanding that those who would seek to practice their specialty and to be admitted to fellowship in their learned bodies be prepared, in addition to fulfilling the usual technical and practical requirements, to give evidence of an adequate anatomic and morphologic knowledge of the parts concerned as a necessary basis on which to build scientific clinical rhinology. Only in this way can the high standards of rhinology be maintained. One cannot conceive of a novice dealing intelligently with the varied problems of the ethmoidal labyrinth.

On the basis of his clinical experience, a review of the literature and experiments on animals, Karpow stated that the pathologic processes in the nose are not to be called "local" only, but that they react on the entire organism. He pointed out that many gynecologists have noted the relation between the genital organs and the nose. Of special interest is the therapeutic effect of cocaine applied to the nose in disorders of the genital tract. The results of forty experiments on rabbits, guinea-pigs and dogs showed that extirpation of the inferior conchae in young animals causes deficient development of the genital tract. He was able to perform resection of each side when the operation was done in two stages. In a weak concentration, aqueous extract of the inferior or middle conchae of a guinea-pig stimulates contraction and causes an increase of muscle tonus in the isolated uterine horns of the same animal; a more concentrated solution induces tetanic contraction of this organ. The action of the extract is intensified in the uterus of pregnant animals or in those that have been pregnant. Extract of the mucosa, bone or muscular tissue from any other part of the nose does not have an effect. The results of these experiments convinced Karpow that the tissue of the conchae (especially of the inferior one) contains a substance that has a specific action on the "nerve muscle" system of the uterus. Whether this action is effective in the living organism, its mode of transmission or the nature of this substance is a problem for further investigation.

Sauter writes on the practical function of testing the nasal spaces, and he comments on the physiology of the nose as a respiratory organ. He expressed the belief that the function of the nose should be suitable for a direct current of air that will coincide with the active and passive thoracic and abdominal respiratory reactions. He said that the pulmonary capacity is dependent on various factors, among the important ones being the amount of energy expended in inhaling the air (according to its moistness, temperature, etc.) and the amount of protection against foreign particles offered by the mucous membranes. It is

easily understood how the physiology of breathing may be varied by a pathologic process in the nasal spaces.

Davis reviewed the relation of the nasal lacrimal duct to the maxillary sinus from an anatomic and a clinical standpoint. The variations of the relations of this duct and the maxillary sinus cavity and of the configuration of the prelacrimal recess are of most importance. In the examination of 50 specimens, he found that 30 showed a prominent lacrimal eminence and an associated prelacrimal recess. To overlook diseased tissue in such recesses and pockets will most likely result unsatisfactorily in a delayed healing process.

Nemours made an extensive study of the comparative morphology of the nasal cavity of *Amphibia*. It is impossible to do justice to the article in a short abstract; it should be read to be appreciated. The author stated that further studies on the comparative anatomy of the nasal structures of higher vertebrates are now under way and will be reported in the near future.

PATHOLOGY AND BACTERIOLOGY

McMahon's article on the histology and pathology of sinusitis and mastoiditis is comprehensive, and his summary of his nasal findings is as follows:

The pathologic changes found in the turbinates and paranasal sinuses were thickening, sloughing, polypoid degeneration and metaplasia of the epithelium with thickening of the basement membrane; the tunica propria showed edema, polypoid degeneration, infiltration with round cells and red blood cells, fibrosis, dilatation or compression of the glands, thickening of the walls of the blood vessels and engorgement of the blood vessels. The periosteum showed thickening and cellular infiltration. The bone showed osteoblastic activity, osteoclastic activity, hyperostosis and osteomalacia necrosis. There were exceptions to the foregoing changes as follows:

Metaplasia was not found in the epithelium of the sinuses, and goblet cells were not seen in the mucosa of the maxillary antrum. The basement membrane usually was not distinguishable in the mucosa of the sinus. In his conclusions, McMahon stated that acute infection of the mucosa was constituted by generalized invasion of young connective tissue cells, red blood cells and polymorphonuclear leukocytes, edema of the tunica propria, dilatation of the mucous glands and absence of changes in the bone. Chronic infection was established by the thickening, metaplasia or sloughing of the epithelium, the large number of older connective tissue cells in the tunica propria, the absence of free red blood cells, the replacement of polymorphonuclear leukocytes by lymphocytes, the thickening of the walls of the blood vessels and

the destructive changes in the bone. Many photomicrographs accompany the article.

Gorham and Bacher reported a series of 8 cases in which the mucoperiosteal lining of the antrum was removed at operation. At intervals of from two weeks to five months they removed specimens of the new lining that was regenerating in the sinus, and confirmed to their own satisfaction the work of Knowlton and McGregor. They stated that, microscopically, the healing occurs first by the organization of a layer of red blood cells that line the antrum. Next, a loose type of epithelium grows over the organized tissue and with it glands re-form. This epithelium gradually changes to a perfect pseudostratified ciliated columnar type, and complete regeneration of the epithelium and glands occurs in about five months.

In a series of experiments, Coates and Ersner also confirmed the now established fact that the mucous membrane relines the sinuses; they used the frontal sinus of a dog. They found that, as in the antrum, the lining regenerates in the frontal sinus. The report on their work is a preliminary one.

Kistner reported 10 cases of sinusitis, with reports of biopsies on material removed at operation. Three of his cases demonstrated the lack of relation between the extent of changes in the tissue and the seriousness of the sequelae. He stated that in none of the biopsies in the 8 cases of disease of the maxillary antrum in which the lining had been removed did he see regeneration of the glands or ciliated epithelium. He found stratified squamous epithelium in 1 case, and the others showed scar tissue with cuboidal or columnar cells in the overlying epithelium. It is difficult to reconcile his observations with those of the previous authors cited. It is well known that mucous membrane, if given a chance, will grow until it completely covers a denuded area. In other words, if the nasal antral wall is well taken down flush with the floor of the nose and the mucous membrane is given a chance to grow across, it will certainly push its way outward and reline the sinus. The only explanation, therefore, of his finding scar tissue in such a large percentage of cases must be faulty technic in the Caldwell-Luc operation.

Eggston made a study of the tissues of the maxillary, frontal, ethmoid and sphenoid sinuses involved in inflammatory processes. The pathologic changes observed were strikingly similar. The changes of paramount value in classification were of a vascular nature. He found that the associated pathologic changes in the contiguous soft and bony tissues were secondary to the vascular changes. The author divided the terminal pathologic lesions in the sinuses into three types: (1) hypertrophic or polypoid, characterized by thickening and edematous changes in the mucous membrane and periosteum, usually associated

with polypoid masses of the soft tissue and rarefaction and osteoporosis of the bone; (2) atrophic, fibrotic, sclerotic or arteriosclerotic, characterized by an increase of fibrous connective tissue in the stroma, thinning of the mucous membrane and metaplasia of the surface epithelium, associated with thickening of the periosteum and a condensing osteitis, and (3) a type resulting from a combination of the hypertrophic and fibrotic changes in the same patient or even in the same sinus cavity. This type is characterized by rugae and sulci as occurring with the production of a papillated type of membrane. The author stated that the vascular basis of the morbid changes in sinusitis receives therapeutic support in the employment by clinicians of drugs that directly affect the vascular system. It is also true that no tissue in the body is more prone to vascular changes from extrinsic and intrinsic causes than the mucous membrane in the nasal cavities.

The physiologic duties of the mucous membrane of the nose have no analogy in any other structure of the body. This is particularly true in relation to the quantity of blood that passes through this region daily, with momentary variation in the quantity as the caliber of the blood vessels changes with every variation in the temperature, humidity or other atmospheric stimuli. Therefore, the slightest alteration of tissue that influences the resiliency and contractility of the vessels will produce altered function.

C. F. Wright studied the clinical and histologic changes in 100 patients operated on for chronic maxillary sinusitis by the Caldwell-Luc method. This series of cases includes patients who came to the outpatient department of the Massachusetts Eye and Ear Infirmary. In both edema and fibrosis of the mucous membrane it was found that the young adult from 20 to 30 years of age showed the widest degree of change. The author stated that the mucous membrane relines the sinus, and how well it does so probably depends on the amount of infection remaining in the nose and the sinuses. In the series of cases on which his paper is based, nineteen of the twenty in which secondary radical operations were performed on the antrum cavities contained mucous membrane that had regenerated. There was a definite subepithelial infiltration of plasma cells and lymphocytes, but this occurred in cases without marked clinical symptoms as well as in those with symptoms. There were no distinct observations that would enable one definitely to correlate the patient's symptoms with the pathologic picture. The toxic agent and the degree of immunity of the patient would seem to govern the pathologic changes.

Linton studied the changes in thirty-three cadavers and in several series of laboratory animals. In approximately 75 per cent of the cadavers, the sinuses were sterile. Of the bacteria found, the staphylococci predominated. The sinuses of the animals were sterile in 88

per cent. Experiments showed that when the tissue was placed in the icebox, good ciliary activity of the mucous membrane persisted for three days after death.

The author noted that the statement is frequently made that the normal nasal sinus is sterile. This does not seem to be an accurate conclusion, since many sinuses that are normal according to the usual criteria contain bacteria. Evidence shows that the normal sinus is contaminated by bacteria and particles of dust from the air with greater or lesser frequency, depending on its anatomic configuration, but that it quickly clears itself of such foreign material.

If it were possible to examine the same normal sinuses at frequent intervals over a period of time, it is probable that bacteria would be found periodically. The amount and frequency of this contamination would depend, of course, on the condition of the air that was breathed. The continued presence of large numbers of bacteria indicates a breaking down or a weakening of the self-clearing activity of the sinuses.

Ashley and Frick reported the results of a bacteriologic and cytologic study of the maxillary antrum; their study covered a series of 83 cases. They concluded that:

1. The normal maxillary sinus does not contain bacteria.

2. Nonhemolytic staphylococci are most commonly found in the maxillary sinus and are related to local processes rather than to systemic lesions.

3. Various streptococci, not always hemolytic, are associated with systemic lesions.

4. Bacteria may be present in the membranes though the washings are bacteriologically negative.

5. Bacteria may remain in a sinus for some time following an infection of the upper respiratory tract, with few or no clinical changes and negative roentgenograms.

6. *Micrococcus catarrhalis* is commonly present in the maxillary sinus following acute colds.

7. In most cases, bacteria play a rôle secondary to other factors in the etiology of sinusitis.

8. A pathologic condition may be present in the antrum, with only epithelial cells in the washings.

9. Turbid washings are as significant in diagnosis as those containing pus or mucopus.

10. Polymorphonuclear leukocytes in washings from the sinus indicate a present or a recent active process.

11. A predominance of mononuclear leukocytes indicates a chronic low grade process.

A pathologic report based on the study of 126 specimens of tissue removed from the nose and nasal sinuses of patients with asthma or vasomotor rhinitis has been reported by Weille. The tissues were examined both grossly and microscopically. The most interesting

macroscopic observation was the presence of occasional pockets of pus in membranes from the sinuses.

Microscopic examination of sections of tissue showed: (*a*) metaplasia, at times of the type of epithelium; (*b*) possibly metaplasia of individual epithelial cells; (*c*) thickening of the basement membrane; (*d*) edema or fibrosis of the tunica propria in two thirds of the specimens; (*e*) active mucous glands and dilated serous glands; (*f*) increased vascularity, no special hypertrophy of the smooth muscle; (*g*) prominence but not predominance of eosinophils as infiltrating cells in tissues of patients with asthma who had been operated on once; (*h*) regeneration of tissue elements in patients operated on a second time; (*i*) marked contrast between "pale" and "red" vasomotor mucous membrane.

A point worthy of emphasis is that, on the basis of the present study, the thickened lining, so frequently reported in the antrum of patients having asthma or vasomotor rhinitis, offers about one chance in nine of harboring pockets of pus, and therefore of being a focus of infection.

According to Hansel, the histologic changes occurring in the nose and sinuses in allergy are: in the epithelium, thickening, hyperplasia and polypoid degeneration; in the tunica propria, eosinophilic infiltration, edema, varying amounts of infiltration with mononuclear cells, round cells and lymphoid cells and of connective proliferation tissue; dilatation, compression and atrophy of the glands; dilatation, thickening and compression of the blood vessels; in the periosteal layer, proliferation of round cells and connective tissue; in the bone, hyperplastic and rarefying or atrophic processes. Gross examination shows polypi in the sinuses of the nose.

Eosinophilic infiltration in the mucous membrane of the nose and sinuses and the occurrence of eosinophils in the nasal secretion and in the blood are indicative of allergy, just as the appearance of eosinophils in the blood, sputum and bronchial structures is indicative of the existence of allergy in bronchial asthma.

The part played by bacteria as etiologic factors in nasal allergy has not been proved, and the general consensus is that bacteria are secondary invaders. Nonsuppurative or hyperplastic sinusitis should be considered as an allergic disease of the sinuses until proved otherwise. Allergic disease of the sinuses with or without secondary infection should be differentiated from primary infection of the sinuses with edema, hyperplasia or polypi.

Allergic nasal disease and disease of the sinuses should be treated conservatively and in conjunction with the treatment for the allergy. Surgical intervention is frequently indicated to restore function and

to eliminate infection. Radium should be used to control edema, hyperplasia and polypoid formations.

Other authors who contributed valuable pathologic observations from the clinical standpoint are Wencke and Harris.

BENIGN TUMORS

Two cases of blastomycosis with considerable involvement of the bone were cited by Iglauer. In each case there was a lesion in the frontal bone. In case 1 it was necessary by repeated laboratory tests to exclude both syphilis and tuberculosis as a cause of the destruction of bone. The observations made at biopsy warranted the conclusion that the lesions of the bone were due to blastomycosis, although the tissue was not removed from the frontal region. This case presented an unusual opportunity for observing a pneumocele from its incipiency until its full development.

The usual roentgen technic failed to show the defect in the wall of the frontal sinus and the nasal connection of the pneumocele.

The configuration and relations of the pneumocele were clearly demonstrated after the injection of iodized poppy seed oil 40 per cent into it. The injection of iodized oil constitutes a distinct aid in the diagnosis of these unusual air tumors.

A case of psammoma (brain-sand tumor), which apparently originated from the dura in the region of the cribriform plate and extended into the left region of the cerebrum and downward into the nose, involving the ethmoid and sphenoid sinuses, was reported by Goodyear. The outer shell of the tumor was bony hard, but the inner portion could be easily curetted. It was considered to be epitheliomatous. Following removal of the tumor, there was an inevitable opening in the dura, but leakage of spinal fluid was avoided by carefully suturing a piece of fascia lata in the dural opening where it lived. There had been no recurrence of the tumor within the nose one year after operation.

Adler reported 2 cases of nasal gliomas. In the first case, that of a girl aged 19, most of the left antrum was filled with a soft tumor that seemed to originate in the ethmoid. The antral mucosa was found to be intact. The tumor included cheesy particles and a large number of fragments of bone. Healing occurred without complications. On microscopic investigation of the tumor, it was found that there was blood beneath the ciliated epithelium; the submucous connective tissue contained a solid mass in the form of cords and a soft mass in the form of nests. Under low magnification, the solid mass seemed to be sarcoma, while under high magnification the cells of the cords and of the nests proved to consist of round nuclei, occasionally surrounded by a protoplasmic areola. The nuclear formations pointed to neuroglia;

they resembled those described by Schaffer in cases of adendroglioma or oligodendroglioma. The presence of intercellular fibrils forming a fine reticulum increased the resemblance to a glioma. The presence of blue homogeneous masses indicating calcareous degeneration was another characteristic of the tumor. The calcium formed a border around the cellular nuclei or was agglomerated in clumps.

The second case was observed in a woman aged 24. Examination showed a slight swelling over the right eye, and the right orbit was tender. The right inferior meatus was filled with a tumor connecting with the turbinate bone. At operation, the anterior ethmoidal cells were found to be filled with a tumor, the posterior cells being filled with pus. There was no tumor involving the antrum. Microscopic examination of the tumors showed practically the same changes in both cases. The condition in the latter case was considered to be nasal glioma, with considerable regressive changes in the form of calcification. Metastases were absent. In one case there was no recurrence five years after the operation, and in the other, none after six months.

Schüller reported 2 cases of tumor of the cerebral base in which a peculiar anomaly took place, namely, a pneumocele of the sphenoid body. The author referred to Olivecrona, who found analogous changes in cases of hyperostosis of the skull, for instance, in cases of acromegaly or of compensatory hyperostosis. On the other hand, the changes in the sphenoid bone resembled those in cases of "pneumatocele dilatans" described by Benjamins, who attributed the anomaly to an enlargement of the pneumatic space caused by an increased pressure of the air. Schüller concluded that a domelike bulging of the top of the sphenoid sinus is a valuable local sign in the diagnosis of an endocranial tumor developing in the region of the anterior or the middle cranial fossa.

Cases of osteoma of the frontal sinus were reported by Beck and Simeoni. Mucoceles involving the sinuses were reported by Sinzinger, Pereira and Adrogue, Seale and Auriti.

MALIGNANT TUMORS

Quick came to the following conclusions in regard to a malignant process in the sinuses: 1. Surgical exploration of the paranasal sinuses and biopsy should be resorted to earlier and more frequently, so that an early diagnosis of new growths may be made. 2. With few exceptions, the principles applying to the surgical removal of cancer in general cannot be carried out in dealing with new growth in the paranasal sinuses. 3. Radium and the x-rays are of value in treating patients with this type of case; however, except in palliative procedures, they must be used in conjunction with surgical intervention. 4. Radium

and the x-rays may be depended on to eradicate the tumor if applied accurately and uniformly throughout the growth in sufficient dosage. 5. Surgical intervention must be employed to provide exposure for the application of radium and adequate drainage. 6. The anatomic relations of the parts are such that infection is a much greater menace here than in new growths in most other locations. In the same bulletin from the Memorial Hospital cases are reported by Duffy, Heiter, S. C. Johnson, Martin, Sharp and V. S. Johnson.

Bianchi gave a detailed, chiefly pathologico-anatomic description of 2 cases of malignant tumors that emanated from the ethmoid bone. They did not begin to cause symptoms until two months before the patients' admission to the hospital, after which the condition became progressively more aggravated. Purulent basal meningitis developed in both cases, and the patients died before operation could be performed. In both cases the clinical impression was that of suppurative ethmoidal sinusitis. A specimen that was excised from the tumor that filled the middle nasal passage was the basis for diagnosis. The author gave a lengthy discussion of the diagnostic difficulties in a clinical sense and of the difficulty encountered in the matter of histopathologic interpretation. The original article contains a complete autopsy report. A number of pictures of histologic preparations are given. Roentgen examination and diaphanoscopy yielded negative results.

A case of primary cholesteatoma of the sinuses which finally terminated in carcinoma and death was reported by Spencer.

Barajas y de Vilches stated that biopsy and roentgenographic evidence of destruction of the bone are invaluable aids in diagnosis. Unless complete surgical extirpation is possible, he recommended radiopathy and electrocoagulation after broad external access has been gained. Sarcomas are most sensitive to radioactivity, while prickle cell and dermoid carcinomas are most difficult of treatment with either irradiation or by surgical intervention. He cited 2 fatal cases in which insufficient irradiation was given.

As his contribution to the Austrian Society for the Study of Cancer, Hajek read a paper on "The Results of Combined Operative and Radium Therapy in the Rhino-Laryngological Clinic During the Past Ten Years," in December, 1929. This author, with his usual thoroughness, divided the nose and throat into anatomic sections and described the clinical results of this combined therapy compared to the results of either one or the other alone. Forty-six patients with a malignant condition in the nose were treated during the ten years; the end-results in only 10 cases are now obtainable. The patients were cured after periods of from one to twelve years. Hajek discussed cases embracing all regions of the nose and throat, and gave a frank exposé of what has been accomplished along these lines in the Hajek Clinic. He

expressed the belief that by this combined surgical and radium therapy the best advances may be expected against cancer; however, he was not enthusiastic about the results that have been recorded on the problem.

Wright cited 8 cases of a malignant condition in the sinuses associated with chronic suppuration. In most of the cases, chronic suppuration antedated the malignant process. As a result of his experience, the author was convinced that preexisting chronic infection is a factor in producing the growth.

FRONTAL SINUS

Tilley, in discussing the technic of operations on the frontal sinus, warned against the use of a sharp curet in the removal of inflamed mucous membrane for fear of spreading the infection and causing fatal osteomyelitis. The edematous tissue should be removed with gauze or blunt forceps. As a result of his experience, he stated that the number of cases of chronic suppuration of the frontal sinus that call for external radical operation are few. The intranasal operation, consisting in removal of the anterior half of the middle turbinate, polypi or hypertrophic tissue, and the enlargement of the nasal frontal canal are adequate in most cases. External operation is indicated when intranasal measures have failed to relieve the chief symptoms, e. g., headache and profuse discharge. Tilley expressed the opinion that there is no single operation that will meet the requirements in every case. The indications for a primary external operation are: 1. A very narrow nasal cavity preventing free access to the ethmoidal region. 2. A tortuous frontonasal canal that proves to be impassible by a suitably curved probe, even after removal of the agger or other anterior ethmoidal cells in the region of the canal. 3. An extensive, irregular and loculated sinus. Not infrequently such secondary intrafrontal sinuses are associated with fronto-ethmoidal cells which spread outward between the roof of the orbit and the floor of the frontal sinus. It is obvious that the most perfectly executed endonasal operation cannot provide effectual drainage for such conditions. 4. Attacks of subacute periostitis of the anterior or of the antero-inferior wall of the frontal sinus associated with tenderness on pressure over those regions and possibly with edema of the upper eyelids. 5. Symptoms of subdural abscess.

Cullom reviewed the literature on the subject and referred to 12 cases in which treatment was given according to the so-called Lynch technic with excellent results. A slight intranasal operation will lead to cure in a large percentage of cases of subacute or early chronic frontal sinusitis. A real deforming, sinus-obliterating operation is required in a small percentage of cases in which the sinuses are large,

but shallow in their anteroposterior diameter. Between these two extremes there are a large number of cases in which the operation may be selected according to the anatomic and pathologic conditions present. No one operation can be selected as suitable for all cases. The name of the Lothrop operation seems to have been changed to the Lothrop-Skillern; Goodspeed is an advocate of this procedure.

Raimondo cited 9 cases in which the patients were cured by the so-called Citelli method. This consists in entering the frontal sinus through a skin periosteal incision 1 cm. long at the inner angle of the orbit, and in making a 3 mm. opening in the bone with Collin's hand perforator. Irrigation with saline or boric solution once or twice daily, rarely a few drops of other antiseptics and keeping the wound open with a small gauze wick comprise the after-treatment. The nasofrontal duct is not interfered with, and its swollen mucosa becomes patent without local applications. Of Raimondo's cases, 2 of acute exacerbation and 2 chronic cases were longest in healing, requiring more than sixty days. Most of the patients were well within thirty or forty days. Scarring was negligible. I think that the foregoing report serves to show that patients with frontal sinusitis may get well under almost any treatment.

Grunwaldt and Monteiro reported cases of cholesteatoma involving the frontal sinus.

THE ETHMOID SINUS

Fenton reviewed various operative procedures, such as those of Tilley, Hajek, Mosher, Sleuder, Ballenger, Pratt, Halle and Moure. After a consideration of these procedures, the author suggested the following steps:

> In hyperplastic cases: (*a*) High septal resection. If speed is not essential, wait a while to see if room enough has not been gained; (*b*) removal of the anterior end of the middle turbinate; removal of polypi, as completely as possible. Again, wait, if time permits; (*c*) remove agger and uncinate by chisel; (*d*) break down a bulla with curette and forceps; (*e*) curette away affected anterior cells; (*f*) break into affected posterior cells with hook, smoothing up with forceps.
>
> General suppurative changes involving the entire ethmoid capsule, with or without polypoid degeneration, call for complete removal, and nothing is gained by delay.
>
> In complete suppurative cases, therefore: (*a*) High septal resection (if needed for access): The septum should be entered from the opposite side, if done simultaneously with the ethmoid; (*b*) middle turbinectomy with scissors and snare; (*c*) remove uncinate by chisel or destroy bulla by spade curette, depending on the anatomic conformation; (*d*) curette and punch away cells to anterior wall of sphenoid, working always back and down, never outward or upward.

Immediate treatment after intranasal operations on the ethmoid should be limited to hemostasis; when oozing occurs, light cotton tampons saturated with a blood coagulant or some other preparation should

be applied for a few minutes. The wound may be swabbed with 2 per cent mercurochrome 1-1230 soluble, 3 per cent iodine or compound tincture of benzoin. Packing should never be used.

Very little subsequent treatment should be given. Exudates from the wound should not be disturbed; clots and scabs are best let alone. There should be no swabbing, spraying or blowing of the nose.

Pleas for more conservative treatment for ethmoiditis are made by Iglauer, Hartsook and Skillern.

McGinnis expressed the belief that many people suffer from focal infection located in the ethmoidal cells, and that there is often very little local evidence of such infection. He advocated conservative drainage of the ethmoid sinuses in this class of case.

Cunningham reported a case in which he used the tip of the patient's little finger to close a long standing fistula of the ethmoid. There is no doubt that the fistula should be closed, but why use the patient's finger?

McCoy cited 3 cases in which he used zinc ionization in cases of chronic suppurative ethmoiditis with good results. He expressed the belief that in selected cases 90 per cent of cures will obtain.

Articles on the external approach to the ethmoids were contributed by Lynch and Faulkner.

THE MAXILLARY SINUS

There were more than 100 articles concerning the maxillary sinus alone. Mollari reported the rare incidence of mycosis of the maxillary antrum in a woman, aged 74; a tentative diagnosis of a malignant process was made. On microscopic examination, the presence of an almost pure culture of *Aspergillus niger* was noted. The author expressed the belief that a genus of ascomycetous fungi caused the disease, and he pointed to the importance of considering the possibility of fungous infection and of making cultures for fungi before fixation of the tissue removed for examination.

Menzel expressed the belief that the usual horizontal incision of the skin and mucosa causes considerable injury to the blood vessels and nerves. He therefore advised a vertical incision, which prevents unnecessary bleeding during operation on the antrum and which preserves the sensibility of the cheek, lips and nose.

Wilkinson, in a study of 332 cases of maxillary sinusitis, came to the following conclusions: A thorough study of each case is necessary before the type of operation is decided on. By studying the history of the case, the changes in the nose and nasopharynx, the results of transillumination, the observations seen by x-ray before and after the injection of iodized oil, and several washings from the antrum, one

should form a mental picture of the mucous membrane lining the antrum and then decide on the type of operation.

Portmann advocated modifications of the Caldwell-Luc procedure: no curettage of the sinus and no sutures.

Imperatori and Kearby each rightly stressed the fact that intranasal window resection of the naso-antral wall is all that is necessary in selected cases. They expressed the belief that when there are gross pathologic changes in the lining, a more radical operative procedure is necessary.

Harris and Weidlein reported a dentigerous cyst of the antrum, which they considered of an unusual type.

A case of chronic maxillary sinusitis with suppurative parotitis as the result of an impacted third molar was reported by Kao.

Hunt stated that the naso-antral methods of operating seldom give permanent relief, and not infrequently they serve only to increase the disability. He advocated the Caldwell-Luc operation in all cases. He seems to be rather radical, especially when it is well known that in properly selected cases a naso-antral operation is all that is required.

Berry gave an arbitrary incidence of 60 per cent in cases of dental caries associated with chronic maxillary sinusitis in adults.

From a clinical study of 100 patients requiring a Caldwell-Luc operation, in the Massachusetts Eye and Ear Infirmary, Wright reported the following observations:

The greatest incidence was in young adults. One third of the patients had frontal headache as a definite factor, while two-thirds did not complain of this. Practically 50 per cent of the patients gave a history of bilateral nasal discharge. Less than one-fourth had frequent, recurring colds. Only 14 per cent had pain over the antrum. In 3 per cent the condition was secondary to infected teeth. Lavage of the antrums had been performed in a little over one third of the cases. One fourth of the patients had undergone a bilateral operation. In only 5 cases was there a history of associated arthritis. The microscopic pathologic changes in these cases have already been cited under the heading of "Pathology."

Smith, in a paper on the nonsurgical treatment for empyema of the maxillary antrum, outlined his treatment in acute cases. Although one may not agree with the details of this treatment, it is refreshing to note that at least not all physicians as a preliminary procedure wash out antrums in which there is an acute condition. The paper is timely and should be read by all those who subject their patients to the wholly unnecessary, painful and often harmful procedure of perforation of the naso-antral wall in the acute stage of sinus disease.

Trotter advocated destruction of polypi in the antrum by diathermy; to direct this work he used an antroscope through the canine fossa.

He used this method in 10 cases, with apparent success. He claimed that this form of treatment is new. It probably is new, but is it progress? It appears to me to be a decided step backward.

A case of tertiary syphilis of the antrum was reported by Popoff.

Harper reported the results of a study of 500 cases of so-called hidden infection of the antrum exclusive of empyema of the antrum. Pathologic observations are given in some of the cases. A Caldwell-Luc operation is advocated in all cases.

A study of latent disease of the maxillary antrum with special reference to the patient's general medical condition is contributed by Rossier and Guggisberg. They claimed that latent maxillary sinusitis is a much commoner disease than is commonly thought, and that it is frequently the etiologic seat of a general disturbance. They presented their report in statistical form, based on a study of 839 patients who applied at the medical clinic for internal diseases. The cases were symptomatically divided into conditions in the various systems of the body, and it was found that 5.2 per cent of the total number of patients suffered from latent maxillary sinusitis. Among other findings was the fact that sciatica was frequently due to this cause. While 18 per cent of the diseases of the respiratory tract were found associated with sinusitis, only 0.8 per cent were found in conjunction with pulmonary tuberculosis. They deduced that there must be a definite antagonism between the two. They deduced, also, that the acute major pulmonary diseases, such as pneumonia and pleurisy, are antagonistic. Chronic bronchitis was associated with latent maxillary sinusitis in about 22 per cent of cases. This percentage is rather high for asthma and bronchiectasis. In conclusion, they stressed the importance of maxillary sinusitis in nontuberculous diseases as opposed to its rareness in tuberculous infections.

THE SPHENOID SINUS

Myerson described his method of exploring the sphenoid sinus, a procedure demanded in two groups of cases: (1) in those in which local symptoms can be traced directly to the sinus, and (2) in cases of general sepsis or of meningitis of doubtful origin. In 75 per cent of sphenoids, a probe may be passed into the ostium; if this is not possible, the anterior wall is readily pierced. After the withdrawal of the probe, a cannula is passed along the same route and the sinus is aspirated or is washed out with saline solution. Bleeding is avoided by the preliminary use of the probe. It must be remembered that the posterior wall of the sinus is quite thin and may be penetrated if care is not taken. Another possible danger is penetration of the cribriform plate, but this can occur only if considerable force is exerted. Preliminary removal of the middle turbinate is unnecessary. The author discussed and criticized other methods of exploring the sphenoid sinus.

Oaks and Merrill reported a case in which there were symptoms of tinnitus, vertigo and pain just above a line midway between the ear and the external occipital protuberance. Lavage of the sphenoid sinuses brought out pathologic secretions, with resultant relief from symptoms. With this in mind, they followed up a number of other cases. They expressed the belief that the syndrome of tinnitus, vertigo and pain in the posterior part of the head denotes chronic or subacute involvement of the sphenoid sinuses.

They minutely reviewed the distribution of nerves, and expressed the opinion that the superior cervical sympathetic ganglion is the switchboard through which this particular reference of pain is accomplished.

Vail reported a case in which the infection of an extremely pneumatized sphenoidal sinus, with extensions into the pterygoid processes, produced intense neuralgia with all the signs attributed to Meckel's ganglion neuralgia. It was shown that this condition was entirely due to neuritis of the vidian nerve. Stimulation of the nerve in its canal caused all of the signs, not only of the vidian distribution as described by Sluder (pain in the ear, mastoid, occiput, neck, arm and hand), but also pain in the upper teeth, with reddening of the conjunctiva, pain in the eye and irregular contraction of the pupil. The condition cleared up completely with the cure of the sphenoidal suppuration.

A case of actinomycosis of the kidney secondary to empyema of the sphenoidal sinus was reported by Recht.

PARANASAL SINUSES IN GENERAL

Lewis reported the results of an analysis of 100 cases of disease of the nasal sinuses in which conservative treatment was given. Under conservative treatment are included certain surgical measures, namely, resection, separation of synechiae or reconstruction of the septum; simple incision of the antrum, bulla and sphenoid in giving vent to the purulent content; removal of polypi; tonsillectomy, and adenectomy.

The nonsurgical measures consist in:

(1) Suitable regular exercise.
   (*a*) Elimination of foods known to disagree with patient.
   (*b*) Selection of foods representing good balance of vitamins.
(2) A dietary regimen.
   (*c*) Selection of foods representing balance of protein, fat and carbohydrate.
   (*d*) Intake of fluid approximately 8 ounces per hour per ten pounds of body weight every day.
(3) Periods of alkalinization, as evidenced by neutrality or slight alkalinity of the urine (alkalinity by no means precludes the possible existence of acidosis).

(4) Periods of iodization, always controlled short of sharp focal reactions.

(5) Use of salicylates sufficient to control pain.

(6) Use of physical therapy, by hot fomentations, radiotherapy or diathermy.

(7) Local therapy, by tamponade (organic silver salts, hygroscopic or both) negative pressure alone or in conjunction with tampons; medicated steam inhalations, with or without oil nebula.

(8) Mechanotherapy, interdiction of hard blowing of the nose, habituation to cleaning the nose by suction down the nasopharynx; negative pressure.

(9) Avoidance of all washes for the nose (Dobell's, Seiler's, salt and soda, etc.); avoidance of insufflations of water while in swimming; avoidance of diving or submerging the head in the sea, pool or bathtub.

(10) Continuance of regimen for months, regardless of prompt subsidence of symptoms, resuming regimen at intervals, even in the absence of symptoms.

The conditions of the upper respiratory tract alluded to in this paper are considered the same as the general systemic conditions under which they develop. Cooperation on the part of the general systemic mechanisms of resistance and of recovery are solicited to a maximal degree in coping with diseases. The essential tissues of the upper respiratory tract should be given all possible opportunities to regain their normal condition and to conserve their ability to function to the utmost, not only for present use, but for withstanding similar vicissitudes in the future. These tissues constitute an important part of the general mechanism of immunization, and, as such, their preservation has an important bearing on the general health of the patient.

A paper by Proetz entitled "Sinus in Perspective," which was practically a plea for thorough study of the individual case before a decision as to the proper treatment was made, brought forth considerable interesting discussions. Both the paper and the discussions are valuable and are well worth reading.

I believe that the chief aim should be to restore the nasal tissues to as nearly a normal physiologic condition as possible; with this in mind, adequate treatment can be applied more effectively and intelligently in individual cases. One should never make a diagnosis of sinus disease or perform an operation in such cases unless one has had a thorough grounding in rhinology. The problem of sinus disease evolves itself slowly but surely in the mind of a physician who has had thorough training and experience. One should use conservative treatment when possible and radical treatment when necessary. Conservative treatment never brings about a cure in cases that require radical treatment, and, vice versa, radical treatment can do great harm when only conservative treatment should be given. The physician who does not know when to use conservative, and when to use radical treatment has no right to perform operations on the sinuses. Ill advised surgical intervention or

choice of method of operation is the cause of many failures to cure patients of pathologic conditions of the sinuses.

Lillie summed up the question very well in his paper on "The Problem of Disease of the Paranasal Sinuses" when he said that there is nothing mysterious or mystical about diseases of the paranasal sinuses. The results of well directed treatment are satisfactory. There is no reason why the general prevalent idea that "once a sinus disease, always a sinus disease" should obtain. A better understanding of the function, physiology and treatment of the paranasal sinuses will overcome this attitude.

Anderson, who made a study of 400 cases of sinusitis, summarized his observations as follows:

> In a review of the histories of 400 cases, sinusitis was not a factor in focal infection. Teeth, tonsils, the prostate gland and other foci are of more importance. Suppurative sinusitis may be a focus of infection on rare occasions. In a patient with a normal nose on clinical examination, and with a history negative for diseases that can be referred to the nose, any exploration which involves mutilation of the nasal membranes is not justified. Unnecessary trauma reduces the resistance of the membrane and may introduce infection. Toxins are absorbed by the blood stream, but bacteria are rarely transmitted to distant parts of the body from the paranasal sinuses. Existing infection of the nose and paranasal sinuses should be treated in the most conservative manner consistent with the complete eradication of the disease.

Dean stated that sinusitis is a deficiency of vitamins plus some factor that causes infection of the sinuses. In the treatment for an infection of the sinuses, a diet rich in vitamin A, together with an increase of vitamin B, is essential. However, the diet does not take the place of either the proper laryngological and rhinological procedures or the observance of the usual hygienic regulations. The latter measures are equally important.

Shurly and Turner wrote on the infection of the accessory sinuses and upper respiratory tract in vitamin A deficiency. The work described is the result of a grant by the Detroit Board of Education to aid research in an attempt to control acute infections among children of school age. The work performed corresponds closely to that reported by Daniel and Armstrong, of Iowa City, who placed thirty new-born infants in the pediatric ward for the first two years of their lives. Infection of the ears or the sinuses developed in only one of these infants, notwithstanding the prevalence of these infections in adjacent wards. The exception occurred in a case in which the mother, in preparing the child's food, skimmed off the surface of the milk (a mixture of cod liver oil and milk). At the time this article was written, these children were 8 years of age. All but one had perfect teeth;

the child whose mother had skimmed the cod liver oil from the milk had mastoiditis.

Hurd stated that the belief that chronic nasal sinusitis is due to bacterial infection should be modified. According to him, bacterial infection is always the final process. Primarily, the mucous membrane is deranged by one of three factors: (1) a deficiency in vitamins, (2) allergia and (3) an endocrine imbalance. All of these ideas are comparatively new developments in medicine, and it may be discovered on further research that a deficiency in vitamins causes a proneness to allergia and endocrine conditions, or that allergia and the endocrine glands have some relation to each other.

Robinson reported a series of 40 cases of polypoid sinusitis in which the patients were treated with radium; in 28 cases surgical intervention by partial or complete ethmoidectomy and antrotomy had previously been performed. Asthma, a complicating factor in 9 cases, was controlled in 7. The mucoid and mucopurulent secretions were lessened. Headaches were relieved, and in a few cases the sense of smell returned. Small polypi were made to disappear, and the interval between recurrences was lengthened.

Mullin made the statement that individualism is the secret of successful handling of cases of chronic sinusitis. He expressed the belief that the greatest secondary complications are pulmonary. One must agree with Mullin, but one must also have a long definition of individualism.

Lawson stated that in chronic diseases of the sinus membrane toxemia is of great clinical significance and probably originates from absorption of small quantities of highly virulent toxins germinated within the sinus cavities.

Whether the important amount of absorption occurs through the sinus membrane or direct from more highly absorptive tissues that receive the toxic material from drainage of the sinuses is a subject for further observation.

Actual secondary infections, or subinfections, do not result from acute and chronic disorders of the sinus membrane with the frequency that should hold theoretically, in view of the purulent character and the amount of pathologic change.

Clinical observations seem to bear out the fact that, when found, secondary infections are usually blood-borne.

Severe constitutional symptoms are seldom produced by uncomplicated disease of the membrane of the sinus.

A low grade toxemia continuing over long periods may have much to do with the progress of the so-called degenerative changes of later life.

In severe acute sinusitis, the systemic symptoms are frequently those resulting from concurrent infection.

Physiologic or pathologic chemistry of the products of the diseased sinus membrane is an almost untouched field.

Uffenorde discussed the diagnostic difficulties in 4 fatal cases of complicated acute suppuration of the accessory nasal sinuses. In the first case an acute unilateral sinusitis was followed by sepsis, and Uffenorde stressed the importance of the blood picture in making the diagnosis. In another case, chills and severe pain in the occiput, the trigeminus nerve and the teeth developed suddenly. Necropsy showed that the infection originated in the sphenoid sinus, perforated the posterior orbital cavity and then led to meningitis. Both of the other cases were similarly difficult of diagnosis, and the author makes a plea to rhinologists that they use all methods at their command in making a diagnosis in obscure cases.

SINUSITIS IN CHILDREN

Dean, Schipfer, Fischbach, Lynch, Vaile, Weinstein, Woodward and Bolotow, while differing in minor points, agreed on the general treatment for sinusitis in children, namely, conservative operation on the sinuses to give ventilation and drainage, removal of the tonsils and adenoids and cooperation with the pediatrician in the regulation of the diet and the production of hygienic conditions. All of these authors considered proper diet as of the utmost importance.

McCullagh made an analysis of the patients under 16 years of age who were admitted to the wards of the Manhattan Eye and Ear Infirmary during 1927 and 1928. Only 48 of the patients gave sinusitis as the chief complaint. During these years, 24,305 patients were admitted to the laryngological wards. Of the 48 with sinusitis, 19 had complications (almost 40 per cent). The patients with ethmoiditis had the largest number of complications, namely, sixteen. Those with involvement of the maxillary antrum had three. The complications were mostly orbital or ocular. All of the patients were discharged as improved after conservative operative treatment.

Esch, in discussing chronic maxillary sinusitis in children, stated that the chief complaint is chronic sniffling. There is no picture of severe illness; during an acute exacerbation, a suppuration occurs that may lead to complications, which, in turn, may necessitate surgical intervention. When the antrum is opened, polypi and thick mucous membranes, with old, dry pus, are usually found.

Chobot reported on the incidence of sinusitis in asthmatic children, and observed that in such patients infection of the sinuses is comparatively frequent; 41 of the 100 children examined gave positive reactions

to tests for sinusitis. He advised conservative treatment, but said that puncture and irrigation should be carried out when conservative measures fail.

The increasing recognition of sinusitis in children as a cause of pulmonary infection is pointed out by Reisman. He summarized the routes of infection as follows: (1) by way of the lymphatic vascular route, i. e., from the submaxillary and retropharyngeal nodes into the deep cervical and internal jugular nodes, then into the lymph ducts, great veins and the right side of heart, and then into the lungs by way of the pulmonary artery, and from the lungs by the lymph channels into the hilar glands; (2) by extension through inhalation.

OCULAR COMPLICATIONS

Thomson expressed the belief that sinus disease is responsible for a considerable proportion of the cases of retrobulbar neuritis, plastic neuritis and a form of neuritis characterized by a sudden functional depression of the optic nerve. The neuritis is the result of direct infection from the sinuses, usually the ethmoid and sphenoid, and is not toxic. If operation is performed early enough, the results are uniformly good.

Poos gave a rather extensive bibliography; he mentioned the anatomic relations of the optic nerve and the posterior nasal sinuses. The author cited the work of deKleyn and Gerlach, who reported a case that at autopsy showed an encapsulated diplococcus in the secretion and membrane of the sphenoid sinus, the optic sheath and the nerve in the optic canal.

He tabulated 120 cases of optic neuritis and papilledema studied at Washington University. In 26 of the patients, the condition was caused by disease of the sphenoid and ethmoid sinuses. Sixteen of these patients were operated on. Twenty-one of the 26 were reported improved on discharge from the hospital. There were 2 cases due to maxillary sinusitis and 1 to frontal sinusitis; in other words, of the 120 cases of optic neuritis and papilledema, 29 originated in a nasal sinus.

Poos also reported a case of bilateral retrobulbar optic neuritis in which the patient did not show improvement after two weeks of local treatment, but in which progressive improvement occurred after the posterior sinuses were operated on. Five months after the operation, vision was practically normal. Ophthalmoscopic examination showed a small amount of temporal atrophy.

Poos' conclusions are: 1. There is often a definite relationship of cause and effect between disease of the nasal sinuses and optic neuritis

that calls for the closest cooperation between the ophthalmologist and the rhinologist. 2. Thoroughness and promptness are necessary in making the diagnosis. Although he pleaded for conservatism, he expressed the belief that there should be no hesitancy in advising surgical intervention when the evidence is reasonably definite and loss of sight is imminent.

De Kleyn stated that rhinologists may almost be said to be divided into two camps on the question of the frequency with which optic neuritis is attributable to infections of the nasal sinus. There can be no doubt as to the frequent concurrence of lesions of the eyes and infections of the sinuses or the close anatomic association of the posterior sinuses and the optic nerve. On the other hand, infections of the sinuses are extremely common; the number of cases associated with optic neuritis form a small fraction of the total incidence of these infections, and there is no close correspondence between the severity of the infections and the liability to involvement of the optic nerve. Histologic evidence bearing on the spread of infection from the sinuses to the nerve is scanty, as the opportunities for obtaining postmortem material are few. These considerations impelled de Kleyn to resolve fully to investigate histologically all cases in which the opportunity occurred of procuring material.

Case 1.—Pansinusitis with secondary panophthalmitis. Cellular infiltration was traced from the mucosa of the sphenoid sinus, through the bony wall, to the sheath of the optic nerve, which was penetrated at one point round a vessel, which had led to cellulitis of the optic nerve.

Case 2.—Acute septic infection of one sphenoid sinus and concurrent phlegmon of the face. The mucous membrane lining the sinus was greatly swollen, and the veins in the bony walls were thrombosed. The sheath of the optic nerve showed slight edema, though the nerve appeared normal on microscopic examination.

Case 3.—Endothelioma growing within the sphenoid sinus and spreading to the dura, where it was in contact with the optic nerve in several places. There was a large central scotoma of the retina on the same side. Microscopically, the optic nerve was normal.

Case 1. demonstrates the possibilty of direct infection of the optic nerve from the posterior nasal sinuses. The damage to the nerve would be irreparable even if the patient recovered from the general infection. In cases 2 and 3, there was an axial neuritis, which was probably due to toxic absorption into the substance of the nerve, and which affected chiefly the more vulnerable central fibers. In most cases the patient recovers from such a lesion.

Although this investigation demonstrates the actual occurrence of the two forms of optic neuritis generally assumed to be secondary to infections of the sinuses, all cases were of extreme severity, and it

would not be legitimate to infer from them that any degree of infection of the sinuses is capable of producing similar ocular lesions.

Redslob, in reviewing the anatomic relation of neuritis to sinus disease, said that he had demonstrated a section removed at autopsy from a child who had died of bronchial pneumonia, in whom the purulent inflammation of the sphenoid sinus had spread through the bony wall of the sphenoid sinus to the adjacent optic nerve. He further mentioned the work of Meller and Hirsch, who found that certain inflammations of the sinus mucosa have presented edema without infiltration or secretion, so that macroscopically the sinus was essentially normal. He also referred to Meller's view that even in cases of multiple sclerosis disease of the nasal sinus is significant.

Redslob cited various theories of the cause of retrobulbar optic neuritis. He stressed what he called a spasmodic contraction of the arteries with a resulting lack of nutrition in the papillomacular fibers.

He mentioned the possible effect of abscessed teeth in the production of retrobulbar optic neuritis.

The author ended his article by saying that all questions in connection with retrobulbar optic neuritis are far from being elucidated, and he advised ophthalmologists to study the exact nature of the syndrome of retrobulbar optic neuritis, for in spite of all, he said, "we are still rather badly advised upon this subject."

About 30 other interesting articles that contain nothing essentially new on this subject appear in the literature.

OSTEOMYELITIS

Woodward stated that the direct cause of osteomyelitis is bacterial infection, usually *Staphylococcus pyogenes-aureus.* It occurs most often in early adult life, as the diploe are more marked at that time. It arises spontaneously or secondary to intranasal or extranasal trauma. The ostium of the sinus becomes occluded, and pus under pressure causes areas of necrosis and venous thrombosis. The infection spreads through the diploetic veins. As the outer table is more porous, it breaks down first. As the diploetic veins pass through suture lines, secondary areas may be found in different bones or on the opposite side. As the dura is highly resistant, meningitis or abscess of the brain is a late complication. Sinus thrombosis is not uncommon. Osteomyelitis is characterized by an insidious onset, the appearance of soft doughy swellings, a persistent septic temperature and, later, intracranial symptoms. Stress is laid on preliminary bacteriologic study. In both acute and chronic cases, the simplest external operation should be employed. If the organism is *Staphylococcus aureus,* a more radical operation is necessary, and the skull should be resected well beyond the diseased

area. The hair should be shaved or clipped closely, so that foci that have formed later may be detected earlier. The wound should be flooded with chlorinated soda. Repeated transfusions are advised. Woodward reported three cases, which occurred in young men with negative Wassermann reactions. The cases were staphylococcal in origin. Two patients had abscesses of the brain; in one case, an abscess was suspected for two months before a definite diagnosis could be made. All of the patients recovered, although 1 required four years of treatment. The other 2 have been well for three years.

Haymann discussed the terms periostitis, osteomyelitis and osteitis. He pointed out that there is no essential difference between osteitis and osteomyelitis. These two terms denote only a difference in the localization of the processes. Osteitis may be considered as a special form of osteomyelitis. The author said that the term osteomyelitis should not be used in a too narrow sense. It should be applied not only to processes complicated by septic manifestations, but also to cases in which sepsis is absent, but in which the process is extended and has a progressive tendency. The latter conditions exist in nearly all of the 8 cases reported by the author. Clinical histories show that the majority of osteomyelitic processes in the maxillary sinus are of dental origin. This proves the necessity of careful asepsis in the treatment of the teeth. However, an inflammation of the accessory nasal cavities may lead to an osteomyelitic process in the wall of the sinus. In a review of various therapeutic methods, Haymann expressed the opinion that in cases in which the process is not too progressive, incision of the abscesses and light baths of the head, repeated several times a day, often bring favorable results. In most cases, however, early operation is advisable. Care should be taken that the healthy bone is not infected with the instruments that have come in contact with the diseased area. Occasionally, when the process is limited, waiting is permissible, but the opportune time for the operation should not be missed.

Tilley stated that the most serious complication of operations on the frontal sinus is diffuse osteomyelitis. For the prevention of this condition, he recommended irrigation of the sinuses before operation and after the sinus is opened. He advocated the removal of thickened lining and polypi with a sponge or blunt forceps rather than with a curet.

Seecof reported a fatal case in which Vincent's organism was associated with other bacteria.

Benjamins reported 3 cases of osteomyelitis of the bones of the skull following inflammatory processes in the nasal septum.

ROENTGENOLOGY

Opaque oil as an aid in the diagnosis of chronic conditions of the sinuses continues to have its advocates, and many papers have been published by rhinologists advocating its use, a few of whom are: Richter, Houser, Jones, LeJeune, Greenfield, Whitaker, Weil, Stout, Glaser, Futch and Snure, Causse, Fraser, Goodyear and Foa and Borsotti. I have yet to see contrast mediums advocated by a well known roentgenologist.

PULMONARY COMPLICATIONS

Manges found three general types of changes in the fields of the lungs in cases associated with disease of the sinuses: (1) general peribronchial thickening evidently due to a generalized chronic bronchitis; (2) a type in which the glands at the roots of the lungs and other tissues in this region are markedly enlarged and produce bronchial irritation and particularly obstruction by pressure, and (3) a more or less localized chronic infection in the lower lobes which frequently leads to more or less extensive degrees of bronchiectasis and diaphragmatic adhesions. The author stated that he could not recall a true abscess of the lung that could be attributed definitely to infection of the sinuses, unless operative intervention had been performed in the presence of infection of the sinuses.

Wasson pointed out that bronchosinusitis is not uncommon in children, starting in very early life (between the ages of from 2 to 5 years). The condition is often difficult to diagnose and must be carefully watched for. There is no common etiology. Numerous bacteria are found. The condition is greatly influenced by lack of vitamins, heredity, environment, climate and contamination from the air. In young infants the condition is recognized by the rattling of mucus in the trachea, which in a few months develops into thymic stridor. This stridor is caused by infection of part or all of the respiratory tract. Some patients recover spontaneously, while in many, as a result of frequent colds, asthma or bronchitis, develops in the second or third year. Some have hay-fever. The condition, which is more or less acute in childhood, later develops into the adult chronic type of disease. The pathologic condition gives typical manifestations clinically, roentgenographically and at necropsy. The portion of the lung most often involved is the hilus, in which a great deal of connective tissue develops. The lymphatics are not specially involved. X-ray pictures of the sinuses and chest present a pathognomonic appearance. After studying an x-ray picture of the chest, a roentgenologist may often foretell the conditions in the sinuses, although the converse is not true. The importance of bronchosinusitis is equal to that of tuberculosis, but there is a definite clinical difference.

Grimball reported observations similar to those reported by Wasson.

Findlay, in a preliminary report dealing especially with infection of the maxillary antrum, stated that he obtained good results in cases in which there are pulmonary complications by cleaning up the pathologic conditions in the sinuses by curetting, drainage and washing. He followed this preliminary article with a statistical report of his results in 36 cases.

Reisman pointed out that the secondary pulmonary complications of sinusitis in children often closely simulate those of tuberculosis.

Kern stressed the importance of thorough and repeated study of the sinuses in cases of chronic pulmonary suppuration, especially those productive of purulent sputum. If involvement of the sinuses is found, a thorough treatment for that condition becomes the essential part of the treatment in bronchopulmonary infection. He stated that more than 80 per cent of his asthmatic patients showed evidence of infection of the sinuses.

Cassady, in an article on sinusitis and chronic cough, stated that patients with these conditions should not be operated on recklessly, but that, if seen in conjunction with the allergist, the condition of many of them can be improved, even though radical surgical intervention of the sinuses is called for. The mode of action of the pathologic process in the sinus in its influence on the cough can only be conjectured. It may act through the lymphatics, by direct extension or aspiration of the secretion, or it may have a reflex action. It is most probable that in cases of asthma and allergic phenomena, the pathologic changes in the sinus interfere with the normal defense mechanism, upsetting the balanced allergic state and aggravating the symptoms.

Smith, working as an otolaryngologist in a large clinic for thoracic diseases, made a study of 1,510 cases of pulmonary diseases. One hundred and sixty-six of the cases proved to be tuberculous, and the remaining 1,344 were diagnosed as nontuberculous. The majority of the nontuberculous cases were diagnosed as bronchitis, subacute bronchitis, chronic bronchitis, bronchiectasis and asthma, and the remainder did not show sufficient changes in the chest on which to base a clinical diagnosis. The author presented the following summary of the most common infections of the upper respiratory tract in the series of 1,344 cases studied:

1. In 464 cases there were deviated septums, spurs on the septums and hypertrophied turbinates. In this group, 51 patients had total nasal obstruction, most of the time. The remainder (413) had partial blockage, and occasionally total blockage. This group had attacks of frequent colds in the head, but not suppuration.

2. Of 582 patients, 50, mostly children, showed nasal discharges; in 105, one or more of the sinuses was involved, most commonly the antrum. Discharges

were not apparent in these sinuses. Thirteen of the latter group had polypi in the nasal chambers; the remaining 427 (adults) had postnasal discharges of varying character.

In the majority of this group, one or more of the sinuses was involved. A small percentage of group 2 had postnasal discharge for which no definite origin could be established.

3. There were 76 cases of various types of ulceration of the nasal mucous membrane.

4. The remainder of the patients had the following conditions: diseased tonsils, enlarged tonsils and adenoids, elongated uvulae, an increase of hypertrophied tissue of the pharynx, pyorrhea, caries, a granular pharynx and various conditions of the lungs.

Smith impressed the importance of close cooperation between the laryngologist and the physician for both the diagnosis and the treatment of nontuberculous lesions of the lungs. He stated that no condition of the chest should be finally diagnosed without a thorough search for the foci of infection in the head.

Other authors who reported on pulmonary complications associated with sinusitis are Buck and Bouvy.

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PLASTIC SURGERY

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An outstanding contribution to the literature on devastating burns, which present so many problems in reparative surgery, is that made by Underhill [1] and a group working on research at Yale. Attention is focused on the concentration of the blood following the loss of water from the body after burns. First there is the positive loss of fluid by permeation outward, the fluid being identified, through its coagulation on the surface, with the plasma which fills the interstices between the cells; next the capillaries are rendered unable to exercise the normal constraint on the passage of water from the arteries, and finally, the return vessels are inhibited from maintaining a supply of fluid to the blood stream, which therefore becomes concentrated with results that become disastrous after a certain degree of concentration of the blood has been attained. Studies reported in other of these reviews have been addressed to the effect of tannic acid and other devices for interrupting the loss. Underhill's studies lay more emphasis on continuous and unremitting introduction of water, with salt in the physiologic solution (since without salt water does not move in the body), until blood tests have established that the danger has been averted. Every one who has resorted to skin grafting soon after the actual burn period has had reason to be apprehensive of conditions that defy control. In this study there was investigation of various toxins the presence of which has been suggested as accounting for these disturbances, with negative results. It would seem, therefore, that a blood test for concentration is to be considered an essential preliminary when the burns are fresh and grafting is indicated. It may prove to be particularly important when the patient is a child.

At the other end of the burn picture there is a most useful contribution by Garlock [2] in his discussion of relief of contractures at the axilla. Restoration of function is, when all is said, the main effort of reparative surgery, and when, as in burns of the chest, contractile scar has an immobilizing effect, only judicious skin grafting can effect the desired release. This article properly emphasizes the necessity of eliminating the contractile scars in the subcutaneous tissues, and affords

1. Underhill, F. P.: Significance of Anhydremia in Extensive Superficial Burns, J. A. M. A. **95**:852 (Sept. 20) 1930.

2. Garlock, J. H.: A Method of Reconstruction of Axilla for Contractures, Surg., Gynec. & Obst. **51**:705 (Nov.) 1930.

as well a nice example of the special availability of different forms of graft, from the thin but effective Thiersch to the migrated tubed pedicle.

Restoration of function to the hand and fingers may bring into requisition many procedures and different materials of replacement; however, the principle is always the same. There must be elimination of the contractile agency first, if such exists, if relief is to be permanent. Koch [3] and Krida [4] presented interesting examples of what can be done by division and transplantation of tendons. This is work that calls for the nicest exactitude, in view of the nature of the material. Everything hinges, in what concerns the restoration of function, on there being not too little and not too much. When disfigurement of the hand and finger has resulted from burns, the tendons may be found embedded in tissue scars, and may even themselves be affected. There may be need not merely to splice and extend but even to eliminate and replace by drawing on the unaffected tendon. And then there may be the need to give flexibility to the whole under a suitable skin covering. The intermediate skin graft is notably effective in such instances. It "takes" with almost the facility of the Thiersch graft, can be had in the desired quantity, adapts itself to the contour better than the full thickness graft, and retains the natural coloration of the skin, which the Thiersch graft does not.

There has been useful attention, also, to the properties and uses of fascia. Graetz [5] has reported experiments, on an engineering basis, to establish its tensile strength. He succeeded in demonstrating that it yields infinitesimally under increasing pressures, say from 20 to 40 pounds (9 to 18 Kg.), and that it breaks at about 66 pounds (29.9 Kg.). Within the sphere of practically no change, it withstands pressures superior to any it will encounter in practice. Its elasticity is found also to be unaffected, a fact of prime importance, since in its mechanical uses, as in the correction of facial paralysis, this property reacts to the play of muscles to which it is attached and differentiates it from, say, a mere suture thread of the same length. Blair,[6] in an article supplementary to his original discussion of the use of fascia in facial paralysis, pointed to the frontalis muscle as receiving the ends of fine strips carried through the lower eyelid and upward. Graetz noted, by the way, that

3. Koch, S. L.: Contractures of the Hand, Surg., Gynec. & Obst. **52**:367 (Feb.) 1931.

4. Krida, A.: Tendon Transplantation for Irreparable Musculospiral Injury, Am. J. Surg. **9**:331 (Aug.) 1930.

5. Graetz, C. M.: Tensile Strength and Elasticity Tests in Human Fascia Lata, J. Bone & Joint Surg. **13**:334 (April) 1931.

6. Blair, Vilray P.: Further Observations upon the Compensatory Use of Live Tendon Strips for Facial Paralysis, Ann. Surg. **92**:694 (Oct.) 1930.

the tensile strength of fascia is all in one direction, a fact that makes trouble sometimes when it is used in cases of inguinal hernia.

If there is a principle that applies to reparative surgery of all kinds, it is that there is advantage to be had from the division of materials. This is notably true of the skin. Dorrance [7] has furnished an interesting proof that it is true also in regard to bone. Why should one use a full thickness bone graft if an osteoperiosteal graft will do as well? Obviously, the traumatic insult is less. He has gone far to demonstrate that in practice, as in theory, there is no need for excision where the lesser graft will avert that resort.

It becomes more and more evident, as that which we have been calling plastic surgery concerns itself with fascia, tendons, cartilage and bone in some circumstances, as well as the skin, that reparative surgery is a better name for the procedure, and that it includes, certainly as a collateral, those branches that have specifically to do with bones and joints, concerning which Moorhead [8] and Albee [9] have published authoritative articles since the last review. Postgraduate students will inevitably find themselves seeking coordinate instruction in all divisions of the same subject. What one notes in both articles is an insistence on concern for the physiologic principles and something like consecrated impatience with those who fail because they seem to see not much farther into the ways of living tissues than if their training was that of carpenters and joiners rather than of surgeons. The lesson is worth teaching and worth learning. Otherwise, one must learn by trial and error, what one might realize without the error, that tissues respond according to their kind and not to what is demanded of them.

In the matter of the correction of nasal disfigurements, perhaps the only point in controversy is one raised by Roy [10] as to the relative merits of the saw and chisel in the separation of the bony arch from the maxillae. This again is partly a matter of physiology; his views have been traversed in an article by me.[11]

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7. Dorrance, G. M.: Osteoperiosteal Bone Grafts, Ann. Surg. **92**:161 (Aug.) 1930.

8. Moorhead, John J.: Practice of Traumatic Surgery, J. A. M. A. **96**:1191 (April 11) 1931.

9. Albee, F. H.: Principles of Treatment of Non-Union of Fracture, Surg., Gynec. & Obst. **51**:287 (Sept.) 1930.

10. Roy, J. N.: The Method of Choice for the Correction of Hump Nose, Arch. Otolaryng. **12**:484 (Oct.) 1930.

11. Sheehan, J. Eastman: Correction of Nasal Disfigurements by Readjustment of the Framework and Tissues, Arch. Otolaryng. **13**:584 (April) 1931.

Abstracts from Current Literature

Ear

THE DEAF CHILD. RICHARD L. BOWER, Wisconsin M. J. **30**:5 (Jan.) 1931.

Over 30 per cent of the inmates in institutions for deafness are children with the type that might have been prevented. This acquired deafness commonly follows acute febrile conditions, particularly infections of the nose and throat, measles, scarlet fever and meningitis, during the first five years of life.

Congenital deafness is of biologic origin, with developmental defects largely inherited or of pathologic source, usually syphilitic or tuberculous, present at birth. In the otosclerotic variety, deafness occurs at about the age of puberty. Marriage of the congenitally deaf is to be avoided, as is consanguineous marriage even though free from defect.

Functional testing for hearing before the sixth year of life is only partially satisfactory. The auropalpebral reflex of Bechterew obtained with the aid of a *C*4 fork is best. The deaf child does not laugh. It is a mistake to consign a partially deaf child to a school for the deaf. During acute infections, a child's ears should be closely watched and the drums opened at the first sign of infection of the middle ear. Early removal of the tonsils and adenoids should be done when ear trouble begins.

JANNEY, Milwaukee [AM. J. DIS. CHILD.].

THE VESTIBULOCAPILLARY REFLEX. D. J. VASILIU, Rev. d'oto-neuro-opht. **8**: 753 (Dec.) 1930.

Based on the observations that the internal ear has a rich vascular network with terminal arteries, that excitation of the sympathetic nerve causes vasoconstriction, and paralysis, vasodilatation, that the peribulbar sympathetic plexus can provoke constriction and dilatation of the cerebral vessels, that the normal circulation of the ear is regulated by the periarterial cervical sympathetic nerve and that excitation of the labyrinth can cause distant vasomotor modifications, Vasiliu was able to demonstrate transient spasm followed by dilatation in the capillaries of the fingers during caloric stimulation of the ears.

According to Bartéles, caloric stimulation of the ears causes a reflex vasoconstriction and paralysis of the labyrinth, and the consequent nystagmus is produced by the opposite labyrinth. Barré, Draganesco and Lieou demonstrated vestibular phenomena following the injection of procaine hydrochloride into the deep lateral cervical region. Medicinal substances have different effects on the labyrinth, depending on whether they are sympatheticotonic (epinephrine) or vagotonic (pilocarpine, physostigmine [eserine]). Stimulators of the sympathetic produce hyperexcitability and inhibitors produce hypo-excitability of the labyrinth. By studying the vestibulocapillary reflex, all these hypotheses can be confirmed or nullified.

The following procedure is suggested: 1. Test the subject to see if he is vagotonic or sympatheticotonic. 2. Test the vestibulocapillary reflex in both groups. 3. Administer drugs that will paralyze or stimulate the vegetative system, and, with the capillaroscope, determine the modifications following the caloric test of the ears. 4. Test the patients who have had resection of the cervical or perivascular sympathetic. 5. Photograph the fugitive capillary spasm, if possible. 6. Examine directly with the capillaroscope the meninges and brain in animals. 7. Look for the vestibulocapillary reflex in the fundus of the eye and at the sclerocorneal limbus.

By the accumulation of data from a large number of cases, the author hopes to be able to give a more adequate explanation of the mechanism of the production of nystagmus and of labyrinthine pathology.

DENNIS, Colorado Springs, Colo.

TUMOR OF THE PETROUS BONE, OF MALPIGHIAN ORIGIN, INVOLVING THE DURA AND THE CRANIAL NERVES. J. ABADIE, M. LABUCHELLE and E. LAUBIE, Rev. d'oto-neuro-opht. **8**:758 (Dec.) 1930.

Malignant tumors of the middle ear frequently manifest themselves by appearing in the meatus, by invading the antrum or by labyrinthine disturbances or disturbances in the facial nerves, but cases in which the tumor penetrates the dura and involves the last cranial nerves are rare.

A woman, aged 42, entered the hospital with paralysis of the last five cranial nerves. There was a history of otorrhea four years before, which was cured by operation but which had recurred a few months before admission and was accompanied by cutting pains in the left ear and mastoid. A mastoidectomy was performed, and fleshy vegetations, filling the process and apparently arising in the petrous bone, were found. Healing was prompt but the pains, discharge and deafness persisted, and paralysis of the left facial and glossopharyngeal nerves appeared.

An examination revealed: total paralysis of the facial nerve, the pharynx, palate, larynx, sternocleidomastoid and trapezius muscles and absolute deafness, all on the left side; marked deviation of the tongue to the left. Ten weeks later, paralysis of the external oculomotor nerve and an abundant leakage of cerebrospinal fluid from the left ear appeared. Death occurred two days later.

At autopsy, after removal of the brain, the dura in front of the left posterior lacerated foramen was found raised and perforated by a fleshy mass, which spread out over the surface of the brain over an area as large as a franc piece. Beneath the dura the tumor was found emerging from the petrous bone through a large orifice at its extremity, which was extremely friable. The tumor filled the whole pyramid. The glossopharyngeal, spinal and hypoglossal nerves were embraced by the tumor, 0.5 cm. from their apparent origin, and the sixth nerve was flattened. Nothing of note was found in the other viscera.

Clinically and on macroscopic examination, a primary tumor of the petrous bone, invading the meninges, seemed to be the diagnosis, but histologically it was seen to be an invasion of the petrous bone and meninges by a "spinocellular" malpighian epithelioma. The progress was rapid from without inwards, and no masses were visible in the auditory canal. The origin must have been the pavement meatal epithelium or the cylindric epithelium of the middle ear. Epitheliomas of the middle ear occur, in general, in persons with old otorrheas or chronic suppurating fistulas. To be noted is the clinical analogy between the evolution of this tumor and that of cholesteatoma.

DENNIS, Colorado Springs, Colo.

THE EFFECT OF LABYRINTHINE AND CORTICAL STIMULATION ON THE POSITION OF THE EYES FOLLOWING SECTION OF THE POSTERIOR LONGITUDINAL BUNDLE. E. A. SPIEGEL and L. TOKAY, Arb. a. d. neurol. Inst. a. d. Wien. Univ. **32**:138 (Oct.) 1930.

In young dogs, following experimentally produced lesions of the posterior longitudinal bundle, it was found that the intactness of that structure is more important in the occurrence of conjugate ocular movements after cortical than after labyrinthine stimulation. Destruction of the posterior longitudinal bundle is more difficult to compensate for in the occurrence of conjugate ocular movements following cortical irritation than following labyrinthine irritation. It would seem also that the secondary pathway represented by the tracts running through the substantia reticularis is of greater significance for conjugate ocular movements following labyrinthine stimulation than for those following cortical stimulation.

KESCHNER, New York.

HEREDITARY AND CONSTITUTIONAL PATHOLOGIC CONDITIONS OF EAR AND OF UPPER RESPIRATORY PASSAGES. SIEMENS, Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**:3 (May 5) 1931.

Siemens first reviews the foundations of the modern theory of heredity. He explains homozygoty and heterozygoty, dominant and recessive heredity, sex

limited and sex bound heredity. Further, he stresses the difficulties in researches on hereditary pathologic conditions and points out how insufficient knowledge may lead to grave errors. He deplores that investigations on heredity are still based largely on guess work. Genealogical trees are mostly built on the basis of anamnestic reports, which naturally are not always reliable, for the same pathologic character may be due to different hereditary "anlagen." Deaf-mutism, for instance, may be idiotypic, namely, recessively hereditary, or it may be one aspect of cretinous degeneration, or the result of intra-uterine syphilis, or it may be acquired by birth trauma, or by traumatic injury or by labyrinthitis during the nursling period. This indicates that the various etiologic groups have to be differentiated. The author also warns against the overemphasis on positive cases and stresses that the material on which hereditary studies are made should be large enough. He further points out that not only one pathologic character may be caused by several anlagen, but that one anlage may cause several pathologic conditions. This so-called polyphenic heredity exists then when certain diseases are passed on in more or less definite correlation like osteopsathyrosis for instance. In this case a certain dominant anlage not only transmits the fragility of the bones but also the blue color of the scleras, and later in life there often develops a special form of otosclerosis. To such cases, in which not only one certain organ is affected, the term constitutional disease is frequently applied. The author criticizes the commonly accepted definitions for constitution and points out that the term constitutional disease generally denotes correlations of diseases, and he therefore agrees with Kraus who defines constitution in the sense of syzygiology or correlation. By means of careful statistical methods, one should be able to determine how often and under what conditions otosclerosis develops in osteopsathyrosis, or how great is the certainty that children with hyperplastic pharyngeal ring ("adenoid diathesis") will develop pharyngeal catarrhs or otitis media, or how often certain anomalies of the ear concur with mental disorders and imbecility. As yet little definite knowledge exists concerning correlation. In otology, the frequency of correlations, and consequently the significance of constitution, are often overvalued. All methods that are employed in hereditary studies are based in principle on the determination of the frequency of characteristics in certain spheres of relationship. Such spheres of relationship are the family, the race and twinship. The author evaluates these three methods. Racial pathologic characteristics are of minor value in hereditary research because the different races generally live in a different environment and in a different social milieu, thus it is difficult to determine whether differences in the disease frequency of two races is the result of heredity or of other factors. It is also known that marriages between blood relatives lead to a more frequent manifestation of pathologic conditions, but this practice varies in different races. Investigations on twins are no doubt the most reliable method for the study of hereditary pathologic characteristics. They are particularly helpful in checking the results of familial pathologic studies. In the conclusion, the author points out that the aim of researches on hereditary pathologic conditions should not only be to increase our knowledge about hereditary diseases, but that this knowledge should be a means to a higher aim. A causal therapy in hereditary diseases should be elimination of the pathologic anlagen, but care should be taken that the healthy anlagen are retained.

EDITOR'S ABSTRACT.

OPTICAL INTUITION IN THE DEAF AND DUMB. O. SCHMAEHL, Ztschr. f. Kinderforsch. **38**:67 (Feb. 3) 1931.

This research problem was instigated by the conception of the eidetic (E. R. Jaensch). This term denotes certain persons who are able to reproduce sensations with the reality that usually occurs only in the pathologic field of hallucinations. It has been determined that this capacity is found, as a rule, among youthful persons. The author considers it particularly interesting to find out

how the deaf and dumb act in this respect. No such work has previously been undertaken because of the practical difficulties. He discovers that the methods for attacking this problem that were worked out by Jaensch suffice for the examination of the deaf and dumb; naturally, one must be acquainted with the peculiarities of this type of person. The acne of the eidetic capacity is found to lie about the twelfth year. From then on it decreases in intensity; the only adults who had it were persons with artistic ability. Three types of eidetics were found: those in whom the intuitional phenomenon could be produced voluntarily; those in whom this was present only in a slight degree, and the third group to whom a picture or an object had to be presented before they could reproduce sensations. Deaf and dumb persons showing mental inferiority were found to possess this capacity to a greater degree than those of normal intelligence. However, their reproductions, in contradistinction to those of the intelligent eidetics, were uniformly inflexible. In other words, the author finds little difference between the normal children and the deaf and dumb in so far as eidetic faculty is concerned.

REICHLE, Cleveland [AM. J. DIS. CHILD.].

THE PHYSIOLOGIC AND CLINICAL SIGNIFICANCE OF THE PATHOLOGICO-HISTOLOGIC CHANGES IN THE INTERNAL EAR AND CENTRAL NERVOUS SYSTEM IN NEW-BORN INFANTS WITH ABNORMAL FETAL POSITIONS. A. PRECECHTEL, Časop. lék. česk. **68**:149 (Feb. 1) 1929.

A short review of the literature on the action of the vestibular apparatus, reflexes associated with orientation and the development of the nerves and myelination, is followed by case reports. In six cases with fetal malposition, changes in both the cochlear and vestibular portions of the internal ear were found associated with changes of the central nervous system, especially in the cerebellum. Where changes of the central nervous system were found alone, they were in the oblongata, midbrain and cerebellum. The changes were a hypotonic degeneration of the neuro-epithelium, and aplasia, fissuring and heterotaxia of the central organs. In one infant with a normal position, bilateral degeneration of the cochlea and normal vestibular portions were found. Heredity of defects of the central nervous system, heredity of pathologic fetal position, development of deafmutism and types of deafmutism are discussed.

STULIK, Chicago [AM. J. DIS. CHILD.]

Pharynx

REPORT ON TWO CASES OF SEPTICAEMIA FOLLOWING TONSILLECTOMY. W. R. F. COLLIS, Proc. Roy. Soc. Med. **24**:318 (Jan.) 1931.

Case 1.—A girl, aged 5 years, had her tonsils removed by enucleation. A small peritonsillar abscess was found at operation; otherwise nothing unusual was noticed. The following day a high temperature commenced, and the child died with all the symptoms of septicemia the next day.

Case 2.—A girl, aged 7 years, was operated on after the child in case 1, on the same day. It was noticed at operation that the follicles were inflamed and the tonsillar glands enlarged. The operation was performed without incident, and the following day all the symptoms of septicemia developed with a high swinging temperature, rigor, and the presence of blood and albumin in the urine. The child died. Both children's blood showed Streptococcus scarlatinae. The children lay next each other in the recovery room. The father and sister of the second patient had contracted scarlet fever about the same time. Swabs were taken from their throats, and the presence of the same type of scarlet fever streptococcus as that found in the heart's blood in case 1 was demonstrated.

WILLIAMSON, New Orleans.

ENUCLEATION OF TONSIL IN ACUTE STAGE OF INFLAMMATION. K. MATHÉ, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **128**:225, 1931.

Mathé recommends that in acute inflammatory processes of the tonsils or in peritonsillar abscesses, which may be complicated by such conditions as sepsis, thrombophlebitis or phlegmons, the diseased tonsil be enucleated. The author discusses the various methods of anesthesia that are employed when tonsillectomy is done during the infection-free interval. He evaluates local anesthesia and general anesthesia. During general anesthesia there is danger of aspiration of blood, which in turn may lead to pulmonary complications. For this reason local anesthesia is generally considered the method of choice for tonsillectomy. However, when tonsillectomy is done during an acute infection, neither general nor local infiltration anesthesia are advisable, since in these cases the dangers of aspiration in general anesthesia are still more pronounced than during an ordinary tonsillectomy, and infiltration may lead to dissemination of bacteria. For this reason the author resorted to conduction anesthesia by means of nerve block. The nerves innervating the tonsil are: (1) the posterior and middle palatine nerves, (2) the glossopharyngeal nerve and (3) the ramus lingualis of the mandibular nerve. Exclusion of the nerves is effected by a 0.5 per cent solution of procaine hydrochloride-epinephrine. The author describes the method of exclusion and specifies the quantities of the anesthetic necessary for each nerve. He employed conduction anesthesia in twenty cases of enucleation in which there were no acute inflammatory processes, and also in cases with peritonsillar abscesses. In regard to the surgical procedure in peritonsillar abscesses, it is pointed out that it is not always easy to open a peritonsillar abscess; even puncture sometimes fails, and an incision does not aid in the discharge of pus, but later an abscess perforates toward the mouth. For this reason the author advises that at first only the upper pole of the tonsil should be lifted off until the abscess discharges the pus. After that the tonsil should be completely removed. This operation, which was performed in thirty cases, was done under conduction anesthesia, and complications were not observed. [EDITOR'S ABSTRACT].

BACTERIOLOGIC OBSERVATIONS ON PHARYNGEAL TONSILS. B. STRUCK, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:95 (June 26) 1931.

Struck reports the results of bacteriologic tests that were made on the tonsils of seventy-one patients at the university clinic for otorhinolaryngology in Munich. The persons on whom the tests were made were chosen at random, without consideration of sex, age or symptoms. The author gives a short report of each case indicating the person's age, the complaint, the appearance of the tonsils, the result of the examination of the smear and the results of the bacteriologic culture. In the conclusion, he states that in the investigations on the seventy-one patients Streptococcus viridans was the micro-organism most frequently found. Numerous reports in the literature likewise name this streptococcus as the one most frequently detected in tonsillar smears. Only Richardson found more often staphylococci than streptococci. Reichenmüller, Anthon and several authors, who are mentioned by Anthon, observed a relatively frequent occurrence of Streptococcus hemolyticus. The author, however, observed the hemolytic streptococcus only once in pure culture and seven times in the mixed culture. He further states that according to Anthon's opinion the hemolytic streptococcus plays an important rôle in acute tonsillitis, and several other workers think the same, but Streptococcus viridans seems to be most frequently present in chronic tonsillitis. The question of the occurrence of the hemolytic streptococcus in scarlet fever is not entirely clear as yet, but that it is present frequently, almost exclusively in scarlet fever, has been stated repeatedly. Of special interest is the presence of fusiform, rod-shaped micro-organisms with spirilla. The author detected them in five cases with the typical bacteriologic aspects of Plaut-Vincent's angina. The anamnesis of these patients revealed throat ailments and relapsing tonsillar disturbances. The inspection of the pharynx revealed chronic inflammation. The

tonsils had deep crypts and were reddish or hypertrophied. Quite frequently there were plugs and fluid secretions. But although these five patients showed the bacteriologic aspects of Plaut-Vincent's angina with the clinical aspects of chronic tonsillitis, there were no clinical signs of Plaut-Vincent's angina. Three of the patients had subjective complaints, two were entirely free from them.

EDITOR'S ABSTRACT.

COMPARATIVE INVESTIGATIONS OF THE BACTERIAL FLORA OF THE THROAT MADE IN DIFFERENT PARTS OF GERMANY (WITH SPECIAL REFERENCE TO THE GRAM-NEGATIVE COCCI). T. WOHLFEIL and E. JAFFE, Ztschr. f. Hyg. u. Infektionskr. **112**:46, 1931.

The authors made bacteriologic examinations of the throats of infants and children in various parts of eastern and western Germany, and found important differences in the occurrence of pathogenic organisms. Meningococci and Friedländer's bacilli were found more frequently in western than in eastern Germany. Staphylococci were found in equal percentages. The occurrence of Streptococcus hemolyticus in the throats of school children did not change in frequency during two and one-half years. Gram-negative cocci were evenly distributed in occurrence throughout all age groups of school children. Meningococci were never found in the throats of infants, and hemolytic streptococci were also absent in the throats of infants from 3 to 7 months of age. The incidence of occurrence of hemolytic streptococci increases steadily from age group to age group. The authors advise that throat swabs be cultured within three hours, and they believe that contradictory observations of other writers are due to the failure to follow this procedure.

FARBER, Boston.

THE TONSIL PROBLEM. W. WOLFFHEIM, Ztschr. f. Laryng., Rhin. (teil 1: Folia oto-laryng.) **20**:463 (May) 1931.

In the first part of the article Wolffheim discusses the physiologic significance, the function, of the tonsils. In spite of the numerous theories and the many experimental investigations this problem is still not definitely solved. As the most satisfactory explanation the author considers that theory which considers the tonsils as well as the entire complex of the lympho-epithelial tissues, particularly up to the time of puberty, as the main site of the occult immunization of the body against infectious organisms that enter the respiratory and the digestive tract, and the secondary follicles are considered a protective mechanism against injurious bacterial action. In regard to the pathologic aspects of the tonsils the author states that the pathologico-anatomic definition of tonsillitis is likewise not yet entirely clear. He then discusses the clinical aspects of acute and chronic diseases of the tonsils. It cannot be doubted, and it is proved by the results of operative therapy, that the tonsils may become sources of infection for certain organs as well as for the entire organism. The question when such foci are present in the tonsils and when they are the cause of an infection cannot always be definitely decided. The diagnosis in each case can be made only after the consideration of all the manifestations. The author thinks that tonsillectomy is advisable even if it is only probable that the tonsils are the source of the infection.

EDITOR'S ABSTRACT.

Nose

AN ETIOLOGIC STUDY OF A SERIES OF OPTIC NEUROPATHIES. ALAN C. WOODS and W. F. ROWLAND, J. A. M. A. **97**:375 (Aug. 8) 1931.

The authors cite a previous publication by Woods and Dunn in 1923, in which was reported the study of 86 cases of optic neuropathies, 12.7 per cent of which were due to diseases of the posterior sinuses. The present report is based on

the study of 6,130 cases, 138 of which fall in this group. Of the 138 cases, 48 were cases of primary optic atrophy, 12 cases of secondary optic atrophy, 13 cases of retrobulbar neuritis, 24 cases of atrophy of the papillomacular bundle. The authors found that 8.1 per cent of the optical neuropathies were due to diseases of the posterior sinuses. They report 5 cases of acute retrobulbar neuritis; in 2, which occurred after nasal sinus diseases, there was prompt cure and return of vision following nasal operation. There were 3 cases with definite atrophy of the papillomacular bundle in which there was no improvement of vision after operation on the nasal sinus. There were 2 cases of definite optic neuritis secondary to massive infection of the sphenoid sinuses, which cleared up promptly after operation. There were 8 cases of multiple sclerosis, 2 of which showed some evidence of diseases of the posterior sinuses, but operation on the sinuses had no beneficial effect; there were 7 doubtful cases, probably cases of early multiple sclerosis, which showed no improvement of the ocular condition after operation on the sinus.

H. H. VAIL, Cincinnati.

INTRANASAL DACRYOCYSTOTOMY FOR RELIEF OF LACRIMAL OBSTRUCTION: AN ANALYSIS OF SIXTY-THREE CASES. F. HOLT DIGGLE, Brit. M. J. **1**:391 (March 7) 1931.

The author has performed seventy-nine West operations on patients who were referred to him from the Manchester Eye Hospital, and the results in sixty-three cases were traced for at least nine months after operation.

As to technic, he has abandoned local anesthesia, as the frontal process of the superior maxilla is frequently too dense to remove comfortably under local anesthesia. Anterior middle turbinectomy is avoided, if possible, and the bone in the nose forming the inner wall of the tear sac is removed by a long, narrow and slightly curved chisel, with which three incisions are made down to the outer periosteum; the square-shaped piece of bone is then removed. The removal of the inner wall of the tear sac, while it is often the most difficult step in the operation, is done with the aid of Peterson's long tenaculum forceps, which seize this wall, and the protruding portion of the wall of the tear sac is then excised with a very slender, sharp knife. The opening, if necessary, can then be enlarged with a pair of biting forceps. It is important that this opening should be as large as possible and at the most dependent part of the sac. There is practically no after-treatment, as gauze packing is to be avoided.

Of the sixty-three operations, forty-six (73 per cent) were highly successful. Six of the remaining seventeen resulted in partial cure, and in eleven the result was a failure. The author believes it is important to select suitable cases, depending on the condition in the nose; operation should not be done when the tear sac is acutely inflamed, and those cases in which recurrent inflammations have taken place are not so likely to yield successful results.

KNAPP, New York [ARCH. OPHTH.]

VARIATIONS IN RETINAL ARTERIAL TENSION FOLLOWING NASAL OPERATIONS. M. GUILLERMIN and G. CHAMS, Rev. d'oto-neuro-opht. **9**:1 (Jan.) 1931.

The idea of Rollet, Sargnon, Colrat and others that, in the nasal treatment for retrobulbar neuritis, the ocular trouble results from vascular spasm led the authors to undertake observations of the retinal arterial tension in patients who had undergone nasal operations of various sorts. The method consisted in observing the diastolic pressure of a retinal artery with the ophthalmodynamometer of Baillert just before the operation, immediately afterward, and twenty-four, forty-eight, seventy-two and eighty-four hours afterward. The anesthetic used had no influence on the pressure.

Forty-two cases were studied. The operations were curettage, cauterizations, turbinectomies and septal operations. In two cases the tension was unchanged. The final result was almost always (92.5 per cent of the cases) a lasting hypo-

tension. In 44.5 per cent, this was preceded by a transient hypertension. The anatomic location of the operation or its nature had no relation to the degree of change of the retinal arterial tension. These results indicate the mechanism of the action of nasal operations in retrobulbar neuritis, namely, utilization of a sympathetic reflex. It is suggested that nasal operations are indicated in ocular conditions that seem to be allied to a local arterial hypertension, e. g., certain hemorrhages of the vitreous in adolescents in which no general factor can be incriminated, and spasm of the central retinal artery. It is also suggested that the preceding phase of hypertension be counteracted by appropriate medication when necessary.

DENNIS, Colorado Springs, Colo.

GIANT MUCOCELE OF THE FRONTAL SINUS. S. TRIOSSI, Rev. oto-neuro-oft. **8**:63 (Jan.-Feb.) 1931.

Mucoceles of the accessory sinuses encroaching on the orbit are of interest to the oculist and the rhinologist. Triossi reviews a case of giant mucocele of the frontal sinus in a man of 40 and its diagnostic lessons.

Of the classic triad of clinical signs, a slowly progressive tumor at the inner angle of the orbit and exophthalmos downward and temporally with diplopia and a lessened acuity of vision were present. The third sign, which some investigators (Rollet) think is pathognomonic, a naso-orbital hyperostosis at the junction of the frontal, nasal, ethmoid and maxillary bones, causing a characteristic change of the root of the nose and of the facial expression, was absent.

The unusual secondary features were a noteworthy proptosis (not as extreme as in the cases reported by Garreau and Bellingham), a nonpalpable dehiscence of the floor of the sinus behind the orbital arch (Lyder-Borthen's sign), negative results of a rhinologic examination and a history of a negative exploratory needle puncture. Transillumination showed a relative opacity of the left frontal sinus.

Careful roentgen projections, typical and special, showed a disappearance of the line corresponding to the left orbital margin, and, in the anterior portion of the orbital vault, a notable solution of the corresponding plate of the frontal bone continuing medially without clear boundaries. The left frontal sinus was clouded, and its supra-orbital recess was considerably dilated.

After a consideration of the differential diagnosis and by elimination, the author again considers the probability of a mucocele.

An ample superciliary orbitotomy was performed. On exposure of the periosteum, a second diagnostic puncture was performed, which yielded 25 cc. of a chocolate-colored mucoserous fluid containing large numbers of typical cholesterol crystals. Only then was the true diagnosis, which had hitherto remained uncertain, assured; hence the value of diagnostic puncture in questionable or difficult cases. The pathogenesis, however, could not be deduced from the history or from the clinical or operative observations. The nasofrontal duct was found impervious, but not due to neoplastic masses or to a process of condensing osteitis. As histologic examination of the mucosa of the frontal sinus was not possible, the theory of cystic degeneration of the mucosa remains without proof.

V. R. SYRACUSE.

Miscellaneous

A CASE STUDY IN DEAF-BLINDNESS. RALPH V. MERRY, J. Abnorm. Psychol. **25**:133 (July-Sept.) 1930.

Merry refers first to the successful training of Laura Bridgman by Dr. S. G. Howe and to the later and more brilliant achievements of Helen Keller under the teaching of Miss Sullivan as demonstrating that, barring coincidence of mental deficiency, the deaf-blind are educable and may reach a high intellectual level if proper educational opportunities are available. The deaf-blind require an infinite amount of patience and resourcefulness and a large measure of individual attention

to reach the maximum development. Merry deplores the fact that recently there has been a tendency to give up the individual case method employed in the training of Laura Bridgman and Helen Keller, and an inclination to distribute the few deaf-blind children of school age among institutions for the blind and institutions for the deaf. This, he believes, is unfair both to the institutions concerned and to the children, since the latter belong neither to one group nor to the other and under such training will probably not become adjusted either educationally or socially. He believes that deafness constitutes a more serious social and educational handicap than blindness.

Merry gives in detail the history of a deaf-blind boy who lost sight and hearing at the beginning of his twelfth year, having previously made a school record which was probably somewhat below the average for his age. He outlines the difficulties that were encountered in the psychologic and psychometric examinations of this boy, and points out the defects of the present tests when applied to the deaf-blind. He then outlines some details of the education and training that were applied in this case, and reaches the following conclusions, which affect the treatment of the deaf-blind in general:

1. The individual case method of approach is probably superior to any other in dealing with the deaf-blind. All facts concerning the person should be gathered and interpreted before inferences regarding his capacities are drawn and a course of treatment adopted.

2. It is practically impossible to obtain a quantitative estimate of the intelligence of such a person by means of any existing measurements. Yearly scales such as the Stanford-Binet scales are unsuitable, since in few, if any, instances can all the tests assigned to a particular yearly group be used. Furthermore, the method of scoring makes no allowance for marginal errors, which are of importance in a case of this sort. Tests of performance would probably serve as the most accurate means of judging the intelligence of the deaf-blind if restandardization of the element of time could be effected.

3. While it may be impossible to obtain a quantitative score, a qualitative study of test results will indicate with some accuracy whether the person in question is of good native intelligence, and will also give the approximate extent of his retardation.

4. It seems probable that the deafness of a deaf-blind person is responsible for a greater share of his mental retardation than is his blindness. Serious dearth of vocabulary and awkwardness in the use of language, which are found more commonly among deaf than among blind persons, would seem to bear out this fact.

5. If suitable methods are employed and no native mental defect coexists with the sensory deprivation, there is no reason why a deaf-blind person is not educable. Undoubtedly, a late adventitious case, such as that described in the present study, is a simpler problem than cases of an earlier adventitious or congenital nature. Even these, however, should respond to intensive educational methods, although probably to a lesser extent.

WILLEY, Harrisburg.

RECOGNITION OF TOXIC DIPHTHERIA AND NASAL DIPHTHERIA. FRANZ HAMBURGER, Wien. klin. Wchnschr. **43**:1384 (Nov. 6) 1930.

In toxic pharyngeal diphtheria, the tonsillar or peritonsillar tissue is reddened and swollen and there is usually an extensive membrane. Occasionally, the membrane is only slightly visible and, according to Hamburger, extends over the posterior aspect of the tonsil, where it may not be seen. The color of the membrane may be brownish, or small hemorrhages may be seen in the membrane, and a characteristic odor may be recognized by clinicians with experience in these cases. The fact that the membrane is unilateral or bilateral does not speak for or against the diagnosis. The cervical adenitis in toxic cases is characterized by a succulent feeling of the glandular enlargement, and by the fact that the glands tend to fuse rather than to be discrete. The fever may be high, though it need not be, the face usually shows pallor and the constitutional symptoms increase with each day of the disease.

Nasal diphtheria occurs frequently in infant asylums and children's hospitals. The classic symptom of nasal diphtheria is a blood-tinged mucopurulent nasal discharge. A membrane may often be seen with the aid of a speculum, but it may often be situated so far posteriorly in the nose as to be invisible. Often a crusty lesion appears about the external nares, which may be characteristic. Nasal diphtheria is usually mild, but may occasionally become toxic and lead to post-diphtheritic paralysis. It is often difficult to differentiate between nasal diphtheria and a simple rhinopharyngitis.

ABT, Chicago [AM. J. DIS. CHILD.]

LUMBAR PUNCTURE AND INDICATION FOR OPERATION. B. LANGENBECK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **28**:112 (March 3) 1931.

Langenbeck asserts that a review of the literature shows that most authorities agree on the diagnostic interpretation of the results of lumbar puncture. However, considerable differences exist in the practical interpretation of lumbar puncture in regard to indications for operative intervention in otorhinolaryngology. The author states that at the otorhinolaryngologic clinic in Leipzig, lumbar puncture has for several years been employed in determining the advisability of surgical intervention. He gives a statistical review of all cases in which the results of lumbar puncture were considered in the evaluation of the indications for surgical treatment. In regard to the operative treatment for rhinogenic and otogenic endocranial complications, with the exception of those that were transmitted by the labyrinth, the review reveals nothing new, since the indications for operative treatment in these cases are defined. However, in labyrinthitis and in labyrinthine meningitis, opinion as to when surgical treatment is and when it is not advisable is still divided. Accordingly, the author relates particularly his observations on the significance of lumbar puncture in cases of labyrinthine involvement. In analyzing the cases in which there was a fatal outcome, he found that two patients on whom the labyrinthine operation was performed too early died; however, it is doubtful whether the patients could have been saved by different treatment. A review of the cases in which the operation on the labyrinth was performed in two stages shows that the fatalities in this group could not be ascribed to the surgical intervention, but could be traced to other causes. The author thinks that the somewhat reserved attitude in regard to the opening of the labyrinth that prevailed at the clinic in Leipzig is not to be regretted, and that in the future it would perhaps be advisable to be still more conservative.

EDITOR'S ABSTRACT.

CONSTITUTIONAL PROBLEMS IN PATHOGENESIS OF DISEASES OF EAR, NOSE AND THROAT. W. ALBRECHT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**:18 (May 5) 1931.

Albrecht begins his article with a discussion of the various definitions of constitution, and he sides with those who define constitution as the totality of inherited qualities. He further points out that exact researches on the significance of constitution have to be based on the biology of heredity, and should strive to answer the following questions: which disorders of the organism are due to hereditary anlage and which to environment? How does this or that anlage react to environmental influences? Which qualities readily overcome injurious influences and which do not? Which tissues are capable of energetic resistance and which have slight or no resistance power? What is the nature of resistance? What powers can the organism mobilize for defense, and when do these powers fail? These questions can be answered only by careful observations at the bedside and by histologic studies of the anatomic conditions and the pathologic processes. The author does not discuss the laws of heredity and methods to investigate them, because this is done by Siemens in the preceding article. In the main part of the article the author discusses first those injuries of ear, nose and throat that are a partial manifestation or the result of a general constitutional disturbance. In

discussing the general constitution, he mentions as the three main types the asthenic, arthritic and apoplectic habits. Considering the great significance of the constitutional tenseness of the tissues, the supporting tissue as the foundation of the constitution is discussed first. Osteogenesis imperfecta, for instance, is a partial manifestation of a constitutional inferiority of the mesenchyma. It leads to serious disturbances of the capsule of the labyrinth. A genealogical tree is shown that demonstrates the hereditary character of osteogenesis imperfecta. Chondrodystrophia likewise causes changes in the labyrinth, in that the endochondral layer of the capsule contains unusually large, irregular cartilage rests. Irregular ossifications that develop subsequently present the aspects of osteosclerosis. The anlage of the connective tissue exerts a decisive influence in inflammatory changes such as otitis. All the disorders of the supporting tissue seem to be particularly marked in persons of asthenic habit. The author further discusses immunity, disturbances of the vascular system, diseases of the blood, incretory disorders and development of neoplasms. In the second part of the main discussion the localized changes are discussed, namely: the constitutional malformations of the various portions of the ear, sporadic deaf-mutism, malformations of the air passages, otosclerosis and inflammatory processes of the ear and of the respiratory tract. In many of these discussions genealogical trees are shown that indicate the hereditary character. In the conclusion, the author points out that hereditary anlage determines largely diseases and health of a person, and he shows that this is also true in regard to ear, nose and throat. However, although one recognizes the significance of constitution, many problems are yet to be solved.

EDITOR'S ABSTRACT.

THE ORGANIZATION OF SOCIAL SERVICE FOR SCHOOL CHILDREN SUFFERING FROM SPEECH DEFECTS. KARL C. ROTHE, Ztschr. f. Kinderforsch. **38**:39 (Feb. 3) 1931.

Any organization of this kind must be based on obligatory schooling, since neither the children nor the parents appreciate the importance of the treatment. At the present time, such classes are well organized in large cities, but not so well in small cities, and there are practically none in the country. It is extremely important to correct speech defects, since they have a profound influence on the career of the child. The author offers a plan for the organization of these courses in Austria.

REICHLE, Cleveland [AM. J. DIS. CHILD.].

SOUND TESTING OF STUTTERERS. O. VON ESSEN, Ztschr. f. Kinderforsch. **38**: 53 (Feb. 3) 1931.

The author examined sixteen children in order to discover the frequency with which the various sounds were spoken defectively.

REICHLE, Cleveland [AM. J. DIS. CHILD.].

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Meeting, April 6, 1931

G. A. TORRISON, M.D., *Vice President, in the Chair*

CARCINOMA OF THE ESOPHAGUS. DR. T. C. GALLOWAY.

CASE 1.—*Transpalatal approach for diathermy of a carcinoma of the vault of the nasopharynx.*

This operation is an adaptation of the old method of pituitary gland approach in dogs. In this case an epithelioma arising high on the left side of the nasopharynx could not be reached by retracting the palate, so the soft palate was split in the midline, leaving intact the uvula and the posterior border. The hard palate was split with a chisel to the left of the vomer. Through the 4 cm. hole provided, it was easy to apply the diathermy electrode. Closure was easy, and healing by first intention took place except in an area of 1 cm., which closed in two weeks. The function of the palate was normal at the time of presentation.

CASE 2.—*Surgical diathermy combined with laryngofissure after the St. Clair Thomson method for carcinoma of the larynx.*

The obvious advantage of resection of one ala of the thyroid cartilage with better exposure, greater operative safety and freedom from reaction was emphasized. In one recent case in which operation was performed with Dr. Cottle and in which the cord had not been fixed, the use of the cutting current for excision and superficial coagulation of the bed provided additional safety. In another case in which operation had been performed four months before, the growth had grown over the aryepiglottic fold, and the extrinsic part of the tumor was easily reached with the electrode. Laryngectomy would probably have been no safer and would have been a much more formidable procedure. The immediate results were good, though, of course, nothing could yet be said of the final outcome.

CASE 3.—*Foreign body.*

A coarse bristle 4 cm. long was removed from the right submaxillary duct. A 19 year old boy had been holding the bristle between his teeth when it suddenly disappeared, followed by pain in the floor of the mouth. Three days later the submaxillary gland was swollen and painful, as was the floor of the mouth. An indefinite line of induration was felt along the duct. A no. 2 Bowman probe was passed into the duct, an incision made on this 1 cm. back, fine forceps inserted, and the bristle extracted from the duct. The symptoms immediately subsided, and the incision in the duct healed in one week.

CASE 4.—*Intubation for carcinoma of the esophagus as a palliative measure.*

A tube modeled after that of Souttar, except that it was braced by a longitudinal wire soldered to the rings, was made of coiled German silver wire. The upper coils were expanded to make a flange to hold the tube above the constriction. The tubes were in various lengths, from 5 to 7 cm., with an outside diameter of the body of the tube from 5 to 6 mm. The carcinomatous esophagus was dilated with Jackson bougies and metal dilators, and the tube was introduced by an obturator through a large Bruning tube and left in situ. The first patient, who had been unable to swallow liquids, gained 7 pounds (3.2 Kg.) in the first week. The second patient, who had had almost complete obstruction, had kept the tube in for four weeks and then it had passed per via natura, but left a lumen that permitted the swallowing of fine foods. The tube was to be reinserted when obstructive symptoms developed. One patient died of hemorrhage after intubation; one died shortly after intubation of a cardiac condition hardly chargeable to the procedure.

DISCUSSION

DR. M. H. COTTLE: There is not much to add to what Dr. Galloway has brought out, except that the procedure was undertaken endoscopically, under local anesthesia. As we did not know the amount of reaction that would follow, only a very small portion of each vocal cord was coagulated. About three weeks later, one half of the right vocal cord was treated, which gave the patient sufficient breathing space. This was two and a half years ago, and she still has enough breathing space and enough voice to continue her work.

TREATMENT FOR CARCINOMA OF THE ESOPHAGUS. DR. T. C. GALLOWAY.

Palliative methods were discussed, with a presentation of cases in which intubation was performed. Surgical intervention has not been satisfactory, and there have been only a few cures. A procedure was described which aims at a radical cure of carcinoma of the cervical esophagus. A preliminary pack is placed around the esophagus, low in the neck, for walling off and the development of tissue immunity. This appears to make later manipulations relatively safe, as was demonstrated in the dog and in two cases in man. Diathermy was used after such a pack in two patients; in one, it was applied through the opened but not isolated organ; in the other, it was used after nearly complete separation of the cervical esophagus from its bed. Although the first patient died after two months from local extension and the second twenty-one days following a tracheo-esophageal fistula, the experience with them gives some hope for the radical cure of this lesion.

DISCUSSION

DR. J. HOLINER: Many years ago I drew attention to an early symptom of carcinoma of the esophagus that later was confirmed by others. The first symptoms are often not from the esophagus but from the larynx. If in older people complaining of hoarseness and cough we find the larynx comparatively normal, we should not fail to investigate the esophagus. I do not think that enough stress is put on this point, and that early cases are overlooked because one suspects an extrinsic malignant condition in the larynx, whereas it is in the esophagus. Of course, this is an early symptom, long before difficulty in swallowing or even perforation of a well established tumor direct attention to the esophagus. If we can discover the condition in the earlier stages, I think that we can do more for these patients.

DR. EDWIN MCGINNIS: This work requires a great deal of courage, and I think that it should encourage us to perform operations on the neck rather than only on the mucous membrane.

I have had a good deal of experience with carcinoma of the esophagus. In 1919, I examined and treated ten patients with this disease. The longest any of them lived was ten months. I have also had some experience with the sensitivity of the esophagus to abrasion, and I know how a little external force often starts trouble in the esophagus and a fatal illness develops. I remember one patient on whom I performed esophagoscopy under local anesthesia for diagnosis; the discomfort of the procedure made her turn her head to one side. This turning produced a slight injury to the mucous membrane, and a fatal illness was brought on by a descending infection.

I also had a case in which a fish bone had punctured the esophageal wall. On examination, a small puncture wound could be seen about one-half inch (1.27 cm.) below the introitus. This was the only esophageal injury, but mediastinitis developed, the infection descending from the puncture wound down the fascial sheaths to the chest. The patient died. Postmortem examination showed that there was an opening from the mediastinum into the trachea at the bifurcation, where the mediastinum was found to drain into the trachea; the infection was coughed up by the patient.

Dr. Galloway was wise in using the two-stage operation, because the packing helps to wall off the area. It seems to me that as we gain experience we ought to be successful in the treatment for carcinoma of the upper end of the esophagus.

DR. FRANK J. NOVAK, JR.: I think that Dr. Galloway is to be congratulated on his courage in attacking a problem of such gravity. The approach to the lesion is one of extreme difficulty, and he has, by adapting surgical diathermy to his approach, accomplished something of considerable value. I think that the point of greatest importance is the two-stage operation, the preparation of the tissue around the esophagus before attempting any manipulation of the esophagus by diathermy or by other measures. It is well to understand that this is not necessarily a matter of blocking and of sterilization. This procedure alone will not protect the mediastinal space, but the fact that a mild infection is necessarily brought into the area by the preliminary operation rather prepares the tissue for further manipulations. We know that immediately, within a few minutes, there is a immobilization of polymorphonuclears in this area. These cells are phagocytes. Within a few hours, they are reinforced by histocytes, which do their share in protecting the tissue. This has the effect of establishing a local tissue immunity, which, with further surgical intervention, offers some prospect of success. The patient is not discharged from the hospital with the establishment of the local tissue immunity, as other patients are.

I am glad that Dr. McGinnis is completely sold on surgical diathermy in lesions of the upper respiratory tract. When I presented this matter about eight years ago, it was looked on with considerable skepticism. It was a radical view, and there was some question as to whether the paper should be read. In my experience with diathermy in the larynx, I have found that the preliminary use of radium offers a greater prospect of success than the use of diathermy alone. I think that if we can implant radon seeds or radium and allow the patient to rest for a while and then use diathermy, the chances of relief are greater.

I enjoyed the paper very much and congratulate Dr. Galloway for going into the work and presenting the paper.

DR. T. C. GALLOWAY: I am grateful for the discussion, for I felt somewhat hesitant about presenting material that is still in the period of speculation.

In regard to laryngeal irritation, my impression is that it occurs only when the tumor of the esophagus is large or extends beyond the esophagus. It is my belief that such irritation is a relatively late symptom and usually means extrinsic involvement. If we are to accomplish anything in the treatment for carcinoma of the esophagus, we should see the cases earlier than that.

As Dr. McGinnis pointed out, the esophagus is very susceptible to infection, and that is the reason for such preliminary procedures. We must remember that these cases are among the most desperate in medicine, and that they are a total loss unless we do something. The patients we have treated have been much happier under the procedures that were used, for they felt that a real attempt was being made to help them. The relief from mental agony compensated them for the discomforts to which we subjected them.

We are indebted to Dr. Novak, for he was the pioneer in Chicago in diathermic surgery in our specialty and certainly, from his work, which probably had no better prospects at the outset than this, much good has come to all of us. I am glad he pointed out the importance of local immunity in these cases, for I think that that is probably a larger factor than the mechanical blocking off of the infection.

I think that perhaps the three-stage operation, in which at the second operation only the esophagus is opened and the wound flooded with secretion, will prove better than the two-stage operation.

After intubation, our patients have had no difficulty in swallowing purées and have eaten finely divided meat and vegetables.

THE DEVELOPMENT OF HEAD LIGHTS AND THE INTRODUCTION OF THE GOOD-LITE. DR. PALMER GOOD.

In describing the various kinds of head lights, I deem it advisable to list the qualities of a head light that would make it ideal for the otolaryngologist:

1. It should be useful in every kind of examination or operation, including tonsillectomy, nasal operations, radical operations on the mastoid and bronchoscopy.

2. It should produce a brilliant field of illumination of about 1,000 lumina or foot-candles. It must be brilliant because many of the cavities are illuminated obliquely and a relatively small amount of light is reflected.

3. The field of light should be uniform, and the vertical and horizontal diameters should be about equal and adjustable, from 3/4 inch to 3 inches (1.87 to 7.6 cm.) in diameter.

4. The rays should be parallel so that no sharp focal point exists.

5. Co-axial illumination should be possible.

6. The source of light should be adjustable, so that it can be worn between the eyes, over one ear or at the side of the head.

7. The beam of light should be adjustable, so that it can be deflected sharply down for general tonsillectomy or for the examination of patients in bed.

8. The aperture of the mirror should not be smaller than the average size of the pupil of the eye, so that the amount of reflected light returning to the eye is not reduced. This is about ¼ inch (0.64 cm.).

9. There should be no glare from the edge of the aperture.

10. Standard bulbs should be used as they are readily obtainable and low in cost.

11. There should be no possibility of shock.

12. Overheating must be avoided.

13. Durability must be incorporated, so that the light will have a long life, be reliable and enable the owner to carry it with him in his bag.

14. A single adjustment should suffice for an entire operation.

Because of the fact that no head light was available that fulfilled even a majority of the requirements stated, I began the construction of a head light about ten years ago. Since that time five models have been made, but the latest one is now presented to the medical profession for the first time; I am confident that it fulfills all the requirements.

It is superior to the use of only an electric bulb or an electric bulb in connection with a condensing lens, because it is much brighter and does not overheat. Because it can be worn close to the head between the eyes, it makes the wearer unconscious of the source of light and allows a shadow-free stereoscopic view of the mouth, larynx or plane surfaces. It is superior to the reflecting type of head light because there is no sharp focal point and it is much brighter.

In bronchoscopy and esophagoscopy, the Good-Lite is used with the endoscopic tubes of Killian, Bruening or Hasslinger. The advantages over other methods are many, but, in particulary, they are as follows: more light, no electrical connections to the tubes, no interference with instrumentation, protection to the operator's eye or glasses and illumination that penetrates far beyond the end of the tube.

DISCUSSION

DR. EDWIN MCGINNIS: At the meeting of the Eastern Section of the American Triological Association several years ago, there was some discussion among the men regarding the different types of lights, and Dr. Yankhauer said that the Kirstein light that they were using gave much better illumination that the distally lighted tubes.

I have found, in my work, that the distal light loses its effect if much secretion and blood are present. I think that Dr. Good has an improvement, and I hope that his new bakelite arrangement will reduce the heat of the light, for one of his first lights became very hot after it had been burning for a time.

DR. ROBERT H. GOOD: I had been a user of the Kirstein light from the beginning until about ten years ago, when my son made a light for me. I find that as I get

older I need more illumination. I had difficulty in seeing for operations on the tear sacs with the Kirstein light, but with the Good-Lite I have little difficulty. Since using the Good-Lite, I have discontinued the use of the Jackson tubes. On several occasions, with the Jackson tubes I went into the trachea and bronchus and failed to see the bifurcation, which is impossible with the Good-Lite. After using the Jackson outfit for three years, I went back to a good bright light. On many occasions, when you enter the trachea you can see the foreign body in the bronchus. The Hasslinger tube is larger, and there is more working space for the forceps. It is a great advantage to have a strong light that illuminates far beyond the end of the tube. During the three years I used the Jackson outfit, I failed to remove a safety-pin and a dental burr. Operation on the gasserian ganglion can be performed with half the usual opening by means of this light.

DR. PALMER GOOD: The light, of course, does become warm, but it will not burn the operator's head or hand. I appreciate the remarks of Dr. McGinnis particularly because although he is a user of the distally lighted tubes, he appreciates the advantages of proximally lighted tubes.

A CYST IN THE RIGHT MAXILLARY CAVITY. DR. J. HOLINGER.

In a man, aged 39, who was under treatment for an infection of the nose, an iritis of the left eye developed. He was examined by Dr. Harry Gradle, who found the iritis. Roentgenograms showed the infection on the right side, and one plate revealed a round shadow in the right antrum. The antrum was filled with iodized poppy seed oil 40 per cent, and another roentgenogram showed the shadow very clearly. (Demonstration of x-ray film.) At a Denker operation, portions of the polyp or cyst were removed.

The patient made a rapid recovery, and the iritis promptly disappeared.

DISCUSSION

DR. WALTER H. THEOBALD: This case illustrates definitely something that I have mentioned before, that just where you expect the greatest opacity there is a little light passing through the iodized oil, although it does not sharply mark out the area. In the lateral view, in the center of the area there is a little light in this locality. In the antral view, this does not show, and I should say that the growth must have been very anterior. In the lateral view, we find the clue to the condition.

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTIONS ON OTOLARYNGOLOGY AND PUBLIC HEALTH AND INDUSTRIAL MEDICINE

H. P. SCHENCK, M.D., *Reporter*

Joint Meeting, May 20, 1931

RALPH BUTLER, M.D., and WALTER S. CORNELL, M.D., *Chairmen*

AUDIOMETRIC FINDINGS AND CLINICAL RECORDS IN PHILADELPHIA PUBLIC SCHOOLS. DR. WALTER S. CORNELL, DR. MARIE CURRIE FREY and MISS ROBERTA LAIRD.

In instituting audiometric examinations in public school work, it was found that considerable data rapidly accumulated, which aided in the solution of numerous teaching problems and had a direct bearing on school health problems. Many school children who had been listless and deficient in their school work were found to have acoustic loss. The acoustic loss was found to have a fairly direct relation to certain types of behavior. To a certain extent, when the audiometric record was known, it was possible to predict deficiencies in the scholastic record.

The technical difficulties that required solution were outlined. A portable instrument was essential. The operator had to have had experience not only in handling the instrument but likewise in handling children of varying ages, in order to obtain complete cooperation. No less important was the cooperation of school officials and parents. The medical profession should encourage this work and should see that the children showing definite loss of hearing are followed up by the general practitioner and by the otologist.

The early detection of otitis media and remedial defects was made possible by these routine examinations. When the loss of hearing was too great for instruction by the usual means, the child was sent to appropriate classes for instruction in lip-reading. There is always the possibility that infections of the ear may develop soon after an examination, and when sudden scholastic deficiency appears, a reexamination is in order.

It would be preferable to examine every child on admission to the public schools, in order that defects would come early to the attention of the otologist. We cannot as a rule reach the child of preschool age, but there is little excuse for missing acoustic losses once the child is in school and under the direct supervision of the school health authorities. It is hoped that with the accumulation of further data in various centers, much valuable data will enable the physician to deal earlier and more effectively with the school child with deficient hearing.

NOISE IN INDUSTRY: ITS EFFECT ON THE HEARING AND ON GENERAL HEALTH. DR. HENRY FIELD SMYTH.

Although it has been long recognized that extremely loud explosive noises may be the cause of sudden deafness, often due to perforation of the ear-drum, found at times in gunners and bell ringers, it seemed desirable to consider deafness as an occupational condition rather than as due to explosive trauma. Trunk makers, riveters and boiler makers usually become deaf. Most middle-aged persons living and working in big cities are slightly deaf, owing to the roar and rattle of traffic, motor busses, taxis, engines, sirens, telephones and typewriters. This would indicate that it is not only the extremes of noise that can do harm.

It has been observed clinically that high grades of impairment of hearing are more common among metal workers whose day labor confines them to subjection to intense sounds made up largely of overtones of high pitch, than among those who are subjected to noises of low pitch. Impairment has been found in 50 per cent of smiths and machinists examined, and in 35 per cent of coppersmiths, while normal hearing has been found in only a little over 9 per cent of boilermakers. Of thirty-one boilermakers in one factory, there was not one with normal hearing. In workers in a noisy atmosphere, a true nerve lesion develops, and it increases if the noise is in small, closed spaces as in boilers. Observations on railroad employees show that deafness among engine drivers and stokers increases with age and with years of service. Deafness has been reported among spinners, weavers and beetlers. The impairment of hearing in all these cases has a definite relationship to the duration and the intensive character of the operative sound. Subjective noises were an almost unvarying accompaniment of the impairment of hearing, but dizziness or vertigo was present only in the more advanced cases, in which the upper tone limit in hearing was notably decreased. Dizziness is more likely to be an accompanying symptom in workers in mills and factories, in which the noise of the machinery is accompanied with a sensible vibration.

The disturbance of hearing incident to exposure to loud sounds of high pitch is usually thought to be one solely of the internal ear, but Holt thinks that changes in the middle ear and the sound-transmitting apparatus are mainly the cause of the impairment. Gradenigo distinguishes three types, labyrinthitis without impairment of the middle ear, chronic catarrhal otitis media with labyrinthitis and chronic advanced inflammation of the middle ear with implication of the labyrinth and vertigo, while Ropke is of the opinion that in the majority of cases both the middle ear and the labyrinth are involved.

Noise can impair hearing by its intensity as well as by its duration. It is transmitted not only through the air but also through the walls and floors of workrooms. A single strong sound expression is especially injurious if it occurs suddenly and unexpectedly. The noise injures the most sensitive and most vital parts of the organs of hearing, namely, the auditory nerve endings in the cochlea. Not every human ear is injured by loud, continual industrial noise. The greater the power of resistance of the organism and the healthier the organ of hearing, the less harmful is the effect of noise. Impairment of hearing caused by continuous moderate occupational noise develops gradually and is at first hardly noticed. Examination by an otologist often reveals impairment of hearing in persons not aware of their injury. In cases of impaired hearing, there is first an impaired perception of high tones, but after prolonged exposure, the degenerative process extends to other auditory cells that serve for the perception of lower tones.

Stopping of the ears with plugs of cotton or of flax fiber is not sufficient protection against noise in workrooms. Protection should consist of compact plugs of gauze saturated with petrolatum or wax. If the floor vibrates, straw, cork or rubber soles or felt shoes may be helpful; for kneeling, felt mats may be used. Apprentices coming from families with hereditary aural disturbances should not work in noisy factories. When beginning work in a noisy plant, every employee should be examined by an otologist, and the examination should be repeated at suitable intervals. Endeavors that strive to limit industrial noise should be promoted and supported. They include the proper distribution of machines and suitable contrivances for the suppression of noise. Relaxation in quiet surroundings when away from work is the most helpful means of preventing aural disturbances.

DISCUSSION

DR. DOUGLAS MACFARLAN: As far as noise goes, otologists as well as workers in industrial medicine will be driven by the populace to deal with this question. Secondarily, it is of interest to neurologists. The survey made in New York was a very complete study. Industrial deafness and its damages have been recognized by the Germans, who employ deaf folks in industries that make people deaf. Liability is a most important factor. As yet, the average worker is not aware of the fact that he can claim damages and get away with it. There are about 20,000 deaf children in institutions. The annual cost of these institutions is $10,000,000. The ages of the children range from 6 to 16 or 18 years. These children grow up and go out into the world, and they represent about a third of the totally deaf. There are multitudes of deaf persons, and the time to discover them is early; therefore, they should be reached in the schools. Ultimately, we must get annual examinations for children in the public schools. We will miss some even then, for occasionally otitis media will develop a month or several months after examination. Some years ago, Dr. James A. Babbitt stressed the fact that much may be done to rehabilitate these patients. Lip-reading may be taught them. Some prevention alone may be possible. Seventy-five per cent of the patients are deaf because of the presence of catarrh. We must stop the use of the postnasal drip and must operate on suppurating ears in order to save the hearing. Swelling about the eustachian orifices keeps up the discharge. In cases of catarrh of the ear, there is at least sometimes catarrh of the canal. In regard to the congenitally deaf, we need legislation for sterilization. Usually, when deafened persons bring into the world children who are deaf, we can convince them of the importance of sterilization. Otosclerotic cases are not capable of being diagnosed early. We need legislation for the deaf, because the deaf are more apt to be injured or to injure others.

DR. EDWIN H. MCILVAIN: I am not an otologist and was probably selected to discuss these papers because I came from a noisy place. Dr. Smyth believes that business men and engineers realize what noise is and have a sound knowledge of acoustics, but to them noise means prosperity, and silence means depression. They like noise. Probably no action will be taken against noises in industry,

except nuisance noises, unless definite legislation is encouraged. Electric welding now eliminates riveting. Interiors are built so as to eliminate noise. Typewriters are noiseless. Quite a good sales argument. Competition may foster this factor. Rubber as a foundation for machinery and sawdust compounds have been in the patent office for some time. Mufflers for engines are much the same as the Maxim silencer for rifles. The Maxim silencer and the Burgess muffler are the two outstanding attempts to eliminate or to reduce industrial noise. During the past sixteen years, I have examined several thousand sheet metal workers, and, eliminating the boiler workers, I have not over a dozen records of men who complain of aural disturbances. They probably did not know that they had aural trouble. Noise is a factor in fatigue. This factor must be referred to the psychiatrist and the neurologist.

DR. WALTER S. CORNELL: In public health work in which examinations are being made, it is imperative to have every member of the medical profession working together. Many patients are not treated because of a disagreement between physicians. Differences of opinion are met mainly in considering the question of eyestrain. The examiner who finds deafness sends a note, and the family physician minimizes the condition and blocks the effort. Expensive consultants may also be a factor in discouraging further treatment. The school examination should be carefully considered. It is a pity that we are allowing the sociologists to take the lead on these questions. Noise is a factor not only in industry but also in the general environment, and the factors of light, heat, chemicals, dust, etc., must be considered seriously. As risks multiply, public health workers are striving to correct the conditions as fast as they are found. On the question of compensation, it is pitiful to see the physical condition of men of 50 who apply for the position of school janitors. The city or state should take men 50 or 60 per cent efficient and give them a suitable job.

INDICATIONS FOR REMOVAL OF THE TONSILS AND ADENOIDS. DR. GEORGE B. WOOD.

There is no doubt but that the removal of the faucial and pharyngeal tonsils is frequently followed by most beneficial results; so much so, that it has come to be a most popular procedure, probably outranging, twenty to one, all other operations on the nose, throat and ears. Its popularity is not restricted to the medical profession, as modern parents do not consider their child's education complete until this mutilation has taken place. It is possible that some day we will have on the statutes of our various state legislatures laws making this operation compulsory before a child can be admitted to a public school. In fact, I have had pediatricians intimate that such a thing might not be a bad idea. If the tonsil were a functionless organ, just a vestigial remnant, as is the appendix, and if the operation were free from danger and not accompanied by pain and discomfort, one might advisedly look to the legislature for aid in this time of financial depression.

However, from their often expressed opinions, it is evident that experienced laryngologists do not concur in the idea of the prophylactic operation and recognize the fact that the tonsillar structures of the throat may at times be perfectly normal in that they are not a present menace to the health of the individual; in other words, that there are certain phenomena that should be considered as indications for operation, although it is probable that what constitutes an indication varies considerably in the minds of different operators. In early childhood, the tonsillar tissues of the throat do have an important function as a member of a large group of hematopoietic organs; that the operation is not devoid of pain and discomfort and that it is attended by enough fatalities to class it as an almost major operation must also be admitted. Indications for the operation in children differ somewhat from those in adults, because in children removal of the faucial tonsils is often done as a sort of an appendix to the removal of the adenoids, whereas in the adult the pharyngeal tonsil is seldom disturbed. In not a small percentage of children, the

early removal of the faucial and pharyngeal tonsils is followed by hypertrophy of the other lymphoid tissues of the throat, and this hypertrophy may become a distinct menace to the patient. It is exceedingly difficult to deal with this diffuse tissue. In recent years, whenever the indications have not been urgent, it has been customary to limit the operation to children over 5 years of age. It was surprising to find that indications that were thought present in children between the ages of 2 and 3 years had disappeared two or three years later.

If a positive history of recurrent tonsillitis has been obtained, the operation is indicated without regard to the local appearances of the tonsillar structure. This also holds true in regard to peritonsillar inflammations. For clinical purposes, the cervical lymph nodes may be classed in two groups, the superficial and the deep, but it is the deep glands that especially interest us in the study of infections of the throat. These are divided, anatomically, into the anterior and the posterior group by the anterior edge of the sternocleidomastoid muscle. Situated where the posterior belly of the digastric muscle crosses the anterior margin of the sternocleidomastoid muscle is the largest of these anterior glands. We may term this the tonsillar lymph node, because it receives the lymphatics from the faucial tonsils and the surrounding mucosa. The glands that lie under the muscle constitute the posterior group, and they receive drainage from the pharyngeal vault and the nasal fossae. Therefore, in an infection originating in the pharyngeal tonsil we would expect that the group underlying the muscle would be enlarged, whereas the infection from the faucial tonsil would cause an enlargement of the so-called tonsillar lymph node. Chronic adenopathy of the tonsillar lymph node and the contiguous glands results from faucial tonsillar infection in probably 90 per cent of the cases. If the adenopathy is marked, if it shows recurrent exacerbations, we have a fairly strong indication for tonsillectomy.

Adenoidectomy is indicated between attacks of otitis media, when the pharyngeal tonsil is enlarged or when it has been acutely inflamed at the time of the otitis. The faucial tonsils bear little etiologic importance to the infection through the eustachian tube unless they are greatly hypertrophied or are badly embedded high in the palate. Undoubtedly, a pharyngeal tonsil that is large enough to produce mechanical obstruction has a causative relation to nasal infection, including involvement of the sinuses. In children with frequent colds, careful examination of the pharyngeal tonsil should be made at the beginning of these colds as in certain cases the infection originates in the lymphoid tissue of the nasopharynx. The faucial tonsils do not have any etiologic bearing on nasal infections, and we are not justified in performing faucial tonsillectomy for nasal infections and their associated complications. When enlargement of the faucial and pharyngeal tonsils is great enough to provide mechanical obstruction, their removal is indicated. A faucial tonsil without other indications would need to be exceedingly large to warrant its removal, whereas a pharyngeal tonsil must frequently be removed just because of its size.

Aside from operations performed for relief from acute infection of the tonsil itself, it is possible that systemic disturbances resulting from the absorption of toxic materials from the tonsil are responsible for more tonsillectomies than any other series of indications. This is especially true in adults. It is exceptionally difficult to make a prognosis in these cases, and there is no method of examination that will determine with certainty the responsibility of the tonsil for any systemic infection. The number of diseases that are supposed to originate from a focal infection is so great that they could not possibly be covered individually at this time. Two or three of them seem to occupy considerable attention and perhaps merit discussion. Rheumatism and its allied conditions are today etiologically considered focal infections. In cases of acute rheumatic polyarthritis and secondary chronic polyarthritis, the tonsils, whatever their appearance, should be removed when the acute symptoms have subsided. In cases of rheumatoid conditions and chronic infectious rheumatism, neuralgia and myalgia, the tonsils should be removed if they are diseased. In cases of ostearthritis, Bechterew's disease, gout and arthritis deformans, tonsillectomy seldom, if ever, is of any value.

Bacteriologic studies of the tonsillar flora have failed to produce much data of value. The pressing out of cheesy or of purulent crypt contents may be done in perfectly normal persons, but it must still be considered evidence of tonsillar responsibility in most cases. The purulent débris is of more significance than the harder cheesy débris, which may be only desquamated epithelium. The mere finding of a small quantity of pus in some of the crypts of the tonsil is not by itself an indication for tonsillectomy. As a rule, large tonsils are more frequently sources of harm than smaller ones, but the smaller tonsil can at times be a serious menace. Narrowed crypt mouths or small whitish areas on the surface of the tonsil, due probably to encysted collections of pus, are important local findings. Yet tonsils with a perfectly normal appearance may give rise to serious constitutional disturbances, and many healthy, normal persons have the most foul-looking tonsils. In rheumatic cases, tonsillectomy is not a complete prophylactic guard against more serious complications. Statistics indicate than tonsillectomy has no effect in the prevention or cure of chorea or in the prevention of any of its complications.

It is not the duty of the laryngologist to judge in individual cases whether or not the presenting symptoms are a disease of focal origin. This matter belongs to the general practitioner or the internist, or perhaps to the specialist on diseases of other parts of the body, such as the eye surgeon, the neurologist or the urologist. We need from the internist a statement merely that the condition from which the patient suffers is a focal infection, and then it becomes our duty to estimate the importance of the tonsillar tissues in its etiology. In doing this, we must take into consideration the history of the case as presented by the internist, with his findings and opinion; the history of local inflammatory conditions of the throat, rigidly separating the purely tonsillar inflammation from other infectious conditions of the upper respiratory tract; the condition of the lymph nodes of the neck, and the appearance of the tonsils themselves, and after we have done all this we still have to operate on the possibilities, perhaps probabilities, rather than on any absolute certainty of relief. The tonsils are not the only source of infection, and it is essential that careful studies of the teeth, sinuses and gastro-intestinal tract be made and that infections be cleared up, if possible, before operation is performed on the tonsils.

DISCUSSION

Dr. Ralph Butler: We have to work on probabilities. Given a case with focal infection, we are unable to tell if abscessed teeth or infected tonsils are the cause. Prognosis of the postoperative effect is not accurate or wise.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

Lyman G. Richards, M.D., Boston, *Abstractor*

Thirty-Seventh Annual Meeting, St. Louis, June 3, 4 and 5, 1931

Max A. Goldstein, M.D., St. Louis, *President, in the Chair*

Osteomyelitis of the Skull: The Osteogenic Processes in the Repair of Cranial Defects. Dr. Albert C. Furstenberg, Ann Arbor, Mich.

In any case of osteomyelitis of the skull, one of the important questions, aside from arrest of the infection, is that of the bony repair of the cranial defect created by disease or operation. It has been thought that some portions of the inner table must remain intact as a source of germinal tissue, but it is not entirely essential, since the dura itself appears to be able to act in this same capacity.

In fourteen cases of osteomyelitis of the skull, there were twelve radical operations with removal of all the infected bone. The ages of the patients ranged from 6 to 56 years. Of the fourteen patients, eight recovered and six died. The eight

who recovered were studied roentgenographically in regard to osseous regeneration. In all of them there has been complete regeneration of the bony defect, both clinically and by roentgenograms. The dura appears to act much like periosteum and to be capable of bone production. This process undoubtedly takes place through the action of tiny fragments of bony débris left attached to the dura and from this débris the new bone regenerates.

(The remainder of this paper was a lantern slide demonstration.)

DISCUSSION

DR. ARTHUR PROETZ, St. Louis: It is only by radical operation that such patients will recover, since the dura cannot resist the infection without some form of radical drainage. The suture lines of the skull tend to demarcate the process, since there exists between them a differentiated tissue to which the process tends to be confined.

The use of the infra-red lamp has been found to have a favorable effect on bone regeneration through the irritation caused by its rays.

ROENTGENOLOGY AS AN AID IN THE PRACTICE OF OTOLOGY AND RHINOLOGY. DR. FREDERICK E. HASTY, NASHVILLE, TENN.

Many otolaryngologists are not enthusiastic about the aid afforded their work by the roentgenologist and complain either about poor roentgenograms or unsatisfactory interpretations of them. If either are actually at fault, they are worse than none, and may serve only to mislead the clinician. The very best of equipment and a sufficient repetition of the particular positions wanted will go far to produce satisfactory results which will be of the greatest aid in diagnosis. There is much sinus disease that gives only the minimum of clinical signs in the early stages, in which roentgenograms will be invaluable. Overexposure must be avoided, and allowances made for the great variations in structure in each individual. Special difficulty is presented with children, but it is in them particularly that satisfactory films are so helpful.

The use of an opaque oil is often essential and can be used to advantage even in acute infections of the antrum and sphenoid, where it will often demonstrate unsuspected and otherwise undiscovered pathologic processes. For this purpose, the oil is best diluted with an equal part of petrolatum. Roentgenograms of the mastoid, which are so regularly filmed from the side, may prove still more useful if taken from within or from below, thereby bringing out the lateral sinus in a way otherwise impossible. Such roentgenograms are, of course, not the final test as to the need of an operation, but are of great use at an early stage for future reference and comparison, unless the patient is seen at too late a stage in the disease.

Particular attention should be paid the great variations in the size and structure of the ethmoid and sphenoid sinuses. Any operative findings should be checked with the previous roentgenograms by both the clinician and the roentgenologist, whose mutual knowledge will be thus enhanced. During operation, if uncertainty arises as to the identity of a given sinus, this may be clarified by the use of cotton soaked in iodized oil, which, placed in the sinus, may be filmed at the operating table.

(Lantern slides of films were shown, illustrating the points brought out in the paper.)

PRODUCTION OF VOICE AND SPEECH FOLLOWING TOTAL LARYNGECTOMY. DR. W. WALLACE MORRISON, New York.

This article will appear in full in a later issue of the ARCHIVES.

THE DEVELOPMENT OF THE ORGAN OF HEARING. DR. LOUIS K. GUGGENHEIM, St. Louis.

A lantern slide demonstration was given.

ELECTROSURGERY AS AN AID IN RHINOPHARYNGOLOGY. DR. LEE COHEN, Baltimore.

The importance of electrosurgical procedures in general surgery and the increasing demands for such methods on the part of patients compel a consideration of this subject by the laryngologist. With an adequate knowledge of physics by the operator, there is a real place for such methods in many diseases of the upper respiratory tract. Of late, there has been considerable discussion of electrosurgery as a method of tonsillectomy, and numerous unfavorable reports have tended to cast disrepute on it. Nevertheless, tonsils can be satisfactorily removed in this way, though it is not to be advocated as a routine method either in children, for whom it is out of the question, nor in healthy adults, who should be operated on by the usual methods. If advanced age, or some chronic disease, such as tuberculosis or organic heart disease, makes the patient an otherwise poor risk, then electrosurgical methods are indicated. The patient remains ambulatory and requires only a local anesthetic. There is some soreness of the throat but not sufficient to prevent eating; there is no fever or other reaction, and no systemic absorption. The method is also useful in the removal of tonsil remnants and small areas of lymphoid tissue elsewhere in the throat. There is no primary hemorrhage, though secondary bleeding sometimes occurs.

Three types of current are available: (1) the cutting current, used with a wire snare, a method little if at all preferable to the ordinary cold wire snare; (2) the desiccating current, not satisfactory for tonsil work, and (3) the coagulating current, the method of choice in most instances. Here the inactive electrode is placed on the back, and steel needles bent at an angle form the active electrode. Several treatments are needed in tonsillectomy, as the removal of both tonsils at one sitting is too severe a procedure. In general, each tonsil will require three applications, alternating with the left and the right at each sitting.

The topical application of a 2 per cent solution of nupercaine and injection of 5 cc. of 1:1,000 nupercaine will give satisfactory anesthesia. The electrode needle penetrates the tonsil to within a short distance of the capsule. From ten to fifteen punctures are made about one-quarter inch apart. The current is turned on until a local eschar is produced, care being taken not to injure the tongue. After-treatment consists of a warm gargle and codeine if needed. One week later the other tonsil is treated in the same way, and a week after that the first tonsil is given a second treatment for removal of its remnants. The following week the same procedure is carried out on the other tonsil.

Other uses of electrosurgery include nasopharyngeal atresia, hyperplastic ethmoiditis (desiccating current), cancer of the tongue or tonsil and papilloma of the larynx, though in the latter it has not proved as satisfactory as one would expect. For bleeding from the septum, it is not as efficacious as the galvanocautery.

THE OTOLARYNGOLOGIC TREATMENT OF CHRONIC ULCERATIVE COLITIS. DR. C. HOWARD DARROW, Denver.

Chronic ulcerative colitis is a disease of the lower bowel which has often proved most intractable in respect to treatment and which reduces those afflicted with it to a pathetic state of malnutrition and misery. A wide variety of medical and surgical measures have been resorted to in treating this condition, and the results have not always been all that is desirable. Recently it has been discovered that the particular organism that is thought to be the etiologic factor in many of these cases and that has been cultured from the stools, has also been obtainable from the tonsils and teeth, but never from the nose or sinuses. In such cases it has been found in a gratifying number of instances that removal of such foci and the manufacture of a vaccine from them has had a surprisingly beneficial effect on the disease, with cessation of the diarrhea in from a few weeks to a few months and complete restoration of the patient to health.

Attempts to reproduce the disease in animals by intravenous injection of the etiologic diplococcus fail to produce the colonic lesion until given daily for from four to five days.

AN AURAL SYNDROME OF HEPATIC ORIGIN. DR. DANA W. DRURY, Boston.

A group of audiograms was shown.

PREVENTION AND AMELIORATION OF DEAFNESS. DR. AUSTIN A. HAYDEN, Chicago.

The treatment for most forms of chronic deafness are notoriously unsatisfactory and unsuccessful. Unless the problem can be attacked from the preventive point of view, little progress can be made. Prevention must begin first of all antenatally, by discouraging consanguineous marriages and the intermarriage of the deafened. Leagues for the Hard of Hearing should consider the formation of some sort of eugenic association to spread propaganda toward this end.

Prevention of head injuries during childbirth should eliminate one of the sources of deafness. Proper otologic care of the aural complications of the common infectious diseases would go a long way toward improving the present unsatisfactory condition. Any speech defect should warrant investigation of the ears for deafness. During the school age an audiometer group test should be given every two years, beginning at the age of 9, with special tests for those who indicate any deficiency.

More attention should be devoted to occupational deafness in an effort to secure noise abatement for riveters, boilermakers, etc., especially where a family predisposition exists.

Progress through pathologic investigation can be greatly aided if patients with incurable deafness can be induced to will their temporal bones for microscopic study.

Education for the deaf must lie along the line of lip reading, speech and voice conservation and vocational guidance. Some help can often be afforded through the use of hearing aids such as group audiophones. Economically, much can be done by proper employment and placement of deaf people in work in which they are not handicapped. Legislation must secure noise abatement and proper compensation for hearing loss incurred through occupation. The united efforts of otologic societies, sociologists and educators of the deaf and deafened, individually as well as collectively, must be enlisted in the instruction of parents, parent-teacher associations, principals, school children, the general lay public and the deaf and deafened themselves. Some form of information service should be available in regard to quackery, fake-hearing devices etc., progress in lip reading, education and mechanical equipment, and in new inventions and discoveries.

DISCUSSION

DR. E. P. FOWLER, New York: Otologists are divided into those who think they can do more than they can for deafness and those who do not think they can do anything. The rush of surgical work crowds out a real painstaking interest in deafness as a vital problem, and patients go about from one man to another until they find someone who will claim to be able to cure them. The really great opportunity lies with children in the prevention of recurrent tubotympanic catarrh. So-called toxic neuritis may really be due to a local inflammation.

BONE CONDUCTION AS A SOURCE OF ERROR IN AUDIOMETRIC TESTS. DR. MATTHEW S. ERSNER, Philadelphia.

Audiometric charts were shown.

THE PRESENT STATUS OF THYROTOMY IN THE TREATMENT FOR CANCER OF THE LARYNX. DR. GORDON B. NEW, Rochester, Minn.

Since one is practically committed to a specific operation for cancer of the larynx, with no opportunity to repeat it in case of recurrence, many men prefer complete laryngectomy as affording the best chance of cure. Nevertheless, there is still a place for the more conservative thyrotomy, depending on the likelihood of extension. There is great variation in the degree of malignancy in the laryngeal growth, and proper selection as to prognosis makes a big difference in the treatment to be followed. A careful history and microscopic grading of the tumor just before operation will be of invaluable aid in deciding on the best procedure. It is a good idea to prepare for a two-stage laryngectomy, to do the first stage, and then if the microscopic findings warrant, omit the second stage and resort to thyrotomy. In this connection it is well to split the hyoid bone, open the larynx with a saw and remove the growth by the use of a weak diathermy current. The question of removal of the thyroid cartilage must be decided at the time of operation. Thyrotomy itself may be satisfactorily done in two stages.

In six years forty-one patients were operated on without a fatality. During the three years or more after operation, 10 per cent of twenty-three patients operated on had local recurrence. Great importance must be attached to the plan of deciding the operative procedure by the microscopic grading of the tumor tissue.

ACUTE RETROPHARYNGEAL ABSCESS. DR. EARL B. BROOKS, Lincoln, Neb.

Accounts of retropharyngeal abscess may be found in the earliest history of medicine. The condition occurs most commonly in children between the ages of 3 months and 3 years, in connection with general debility or following a great variety of inflammatory conditions. Adults are only occasionally afflicted. The retropharyngeal space is a true one with a sort of partition between and with the pterygomaxillary fossa on each side. The usual pathologic process is that of adenitis of the retropharyngeal lymph glands, following some previous infection of the upper respiratory tract. The resulting dysphagia is partly due to pain and in part to mechanical obstruction; the dyspnea, practically entirely to mechanical pressure on the airway. In addition, there is often some external cervical adenitis which only increases the difficulties of the patient and serves to obscure the diagnosis. While the paramedial swelling is usually fluctuant, it may be from the early stages and the gland may contain no pus. A differential diagnosis must be made between this form of adenitis and adenoids, tuberculosis of the cervical spine, laryngeal obstruction and aneurysm. The important complications are asphyxia, septicemia and pneumonia, hemorrhage, thrombosis of the internal jugular vein, edema of the larynx and abscess of the lung.

Book Reviews

MALIGNE PHARYNX- UND LARYNXTUMOREN. By A. ZUPPINGER. Mit einem geleitwort von H. R. Schinz. Price, 28 marks. Pp. 186. Leipzig: Georg Thieme, 1931.

This is a monograph of 186 pages with more than thirty illustrations and eleven plates, showing photomicrographic reproductions of sections of tumors. The text consists of a study of 280 cases, 32 in which the growth was located in the epipharynx, 105 in the mesopharynx, 120 in the hypopharynx and 23 in the larynx. The study includes the normal anatomy and histology of the pharynx and larynx, the histology of the growths and a discussion of the points to be considered in selecting treatment by radiation. Among the 280 tumors, there were only 20 sarcomas. Of these, 10 were in the epipharynx, 8 in the mesopharynx and 1 each in the hypopharynx and larynx. Carcinoma of the lympho-epithelial group constituted the most frequent tumor in the epipharynx. These have been diagnosed heretofore as simple, solid carcinoma or as lymphosarcomas. In 68 of the 280 cases there was still a possibility for operation. Of these, one-half presented no metastasis.

The cases that permitted only a total laryngectomy with resection of the pharynx are presented as prognostically inoperable. Altogether 82 tumors were found without metastasis. There were bilateral metastases in 38 cases.

The treatment was surgical in the operable cases and, to a smaller extent, combined surgical and radiologic. It is pointed out that removal of the lymph nodes, which was carried out primarily in 22 cases, in a large percentage of cases presents recurrences. The roentgen treatment of a large, single application does not leave the situation sufficient protection against recurrence. Large doses of radium (over 2,000 mg.) applied for a short time in the hypopharynx produced too severe reaction for the patient. Doses of about 1,500 mg. produced, in most cases, ulcerations or more severe results, among which were osteomyelitis of the spine and meningitis. Gastrostomy during treatment with radium is exceptionally dangerous. The palliative operations — gastrostomy and tracheotomy — have, in these cases, a very high mortality. The mortality is greater when the patients have previously received roentgen treatment. The use of gastrostomy for tumors of the hypopharynx is exceptionally questionable. An indication for gastrostomy for tumors of the pharynx and larynx should be definitely restricted. Gastrostomy in cachectic patients is, according to the experience of the author, to be avoided.

The volume includes a bibliography and an index.

ASTHMA AND HAY FEVER IN THEORY AND PRACTICE. PART I: HYPERSENSITIVENESS, ANAPHYLAXIS, ALLERGY. By ARTHUR F. COCA, M.D., Professor of Immunology, Cornell University Medical College; Clinical Professor in Medicine-Elect, New York Post-Graduate Medical School, Editor, Journal of Immunology. PART II: ASTHMA. By MATTHEW WALZER, M.D., Instructor in Applied Immunology, Cornell University Medical College, Deputy Attending Physician, Clinic of Applied Immunology, New York Hospital, Chief of Allergy Clinic, Jewish Hospital of Brooklyn. PART III: HAY FEVER. By AUGUST A. THOMMEN, M.D., Lecturer in Medicine, University and Bellevue Hospital Medical College, Director of Allergy Clinic, Medical College Dispensary, New York University. Price, $8.50. Pp. 851. Springfield, Ill.: Charles C. Thomas, 1931.

The authors have undertaken to present the theoretical and practical aspects of the subjects of hay-fever and asthma, the two most important clinical forms of allergy. As they thought that this presentation was beyond the reach of any one individual, they combined efforts in compiling this volume, which consists of

851 pages. In a volume of this size the aim is to present a rather complete treatise on the topic. No effort is made, however, to include a historical statement of theories that have been discarded. The subject matter does not confine itself solely to hay-fever and asthma, but includes a discussion of the entire subject of hypersensitiveness and the relation to these atopic illnesses. The related conditions of hay-fever and asthma are discussed in separate presentations because of the advantages to the reader and also on account of the difference in the categories of the excitants of these two conditions. The authors believe that the growing importance of these subjects warrants their being discussed in separate chapters. This volume will be of interest to the internist as well as to the rhinologist. Hay-fever and asthma, in fact the whole subject of allergy, are more strictly subjects of interest to the internist than to the rhinologist, although the most annoying manifestations happen to be the nasal symptoms.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Gabriel Tucker, Bronchoscopic Clinic, Hospital of the University of Pennsylvania, Philadelphia.
Secretary: Dr. John J. Shea, 1018 Madison Ave., Memphis, Tenn.
Place: New Orleans. Time: 1932.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. F. Barnhill, Miami Beach, Fla.
President-Elect: Dr. S. Hanford McKee, 1528 Crescent St., Montreal, Canada.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

American Bronchoscopic Society

President: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.
Secretary: Dr. Richmond McKinney, 899 Madison Ave., Memphis, Tenn.

American Laryngological Association

President: Dr. Francis R. Packard, 304 S. 19th St., Philadelphia.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.

American Laryngological, Rhinological and Otological Society

President: Dr. Max A. Goldstein, 3858 Westminster Pl., St. Louis.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.

American Otological Society

President: Dr. David H. Walker, 101 Bay State Rd., Boston.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

SECTIONAL

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. F. M. Sulzman, 1831 5th Ave., Troy.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

New England Otological and Laryngological Society

President: Dr. Harry P. Cahill, 520 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Lyman G. Richards, 319 Longwood Ave., Boston.

Pacific Coast Oto-Ophthalmological Society

President: Dr. Chester H. Bowers, 1136 W. 6th St., Los Angeles.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. Albert E. Hillis, 1115 Pacific Ave., Tacoma, Wash.
Secretary-Treasurer: Dr. Francis A. Brugman, 806 Cobb Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

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* Secretaries of societies are requested to furnished the information necessary to make this list complete and to keep it up to date.

Sioux Valley Eye and Ear Academy

President: Dr. Claude T. Uren, City National Bank Bldg., Omaha.
Secretary-Treasurer: Dr. Frederick H. Roost, 420 Trimble Bldg., Sioux City, Iowa.
Place: Fontanelle Hotel, Omaha. Time: November, 1931.

Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Fletcher D. Woodward, Box 162, University, Va.
Secretary: Dr. W. D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: New Orleans. Time: November, 1931.

Southwestern Michigan Triological Society

President: Dr. C. W. Ellis, 215 N. Walnut St., Lansing.
Secretary: Dr. H. B. Weinburgh, 301 Seymour St., Lansing.
Time: Third Thursday of alternate months.

STATE

Colorado Oto-Laryngological Society

President: Dr. F. J. Peirce, 511 N. Main St., Pueblo.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

Connecticut State Medical Society, Section on Eye, Ear, Nose and Throat

President. Dr. M. H. Merriman, 115 Prospect St., Waterbury.
Secretary-Treasurer: Dr. Walter L. Hogan, 750 Main St., Hartford.

Eye, Ear, Nose and Throat Club of Georgia

President: Dr. William L. McDougall, 50 Whitehall St., S. W., Atlanta.
Secretary-Treasurer: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta.

Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. John W. Carmack, 23 E. Ohio St., Indianapolis.
Secretary: Dr. J. Kent Leasure, 23 E. Ohio St., Indianapolis.

Iowa Academy of Ophthalmology and Oto-Laryngology

President: Dr. Gordon F. Harkness, 215 Main St., Davenport.
Secretary-Treasurer: Dr. W. F. Boiler, 105 East Iowa Ave., Iowa City.

Minnesota Academy of Ophthalmology and Oto-Laryngology

President: Dr. Douglas Wood, 74 S. 9th St., Minneapolis.
Secretary-Treasurer: Dr. W. E. Camp, Medical Arts Bldg., Minneapolis.

Montana Academy of Oto-Ophthalmology

President: Dr. L. H. Huber, Livingston.
Secretary: Dr. A. W. Morse, Phoenix Bldg., Butte.
Time: Semi-annually.

North Dakota Academy of Ophthalmology and Otolaryngology

President: Dr. F. L. Wicks, Valley City.
Sceretary-Treasurer: Dr. W. L. Diven, National Bank Bldg., Bismarck.

Oregon Academy of Ophthalmology and Otolaryngology

President: Dr. H. M. Hendershott, 193, 11th St., Portland.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

Rhode Island Ophthalmological and Otological Society

President: Dr. Raymond F. Hacking, 105 Waterman St., Providence.
Secretary: Dr. Herman A. Winkler, 224 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Erza Thompson Bldg., Salt Lake City.

Virginia Society of Otolaryngology and Ophthalmology

President: Dr. C. P. Jones, 3117 West Ave., Newport News.
Secretary-Treasurer: Dr. Henry Grant Preston, Harrisonburg.

West Virginia State Medical Association, Eye, Ear, Nose and Throat Section

President: Dr. G. A. Smith, Montgomery.
Secretary: Dr. O. H. Bobbitt, Medical Arts Bldg., Charleston.

LOCAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Charles W. Buvinger, S. Washington St., East Orange.
Secretary: Dr. Earl LeRoy Wood, 192 Roseville Ave., Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. W. L. McDougall, 50 Whitehall St., S.W., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: 8 p. m., last Thursday of each month.

Baltimore City Medical Society, Section on Otology and Laryngology

Chairman: Dr. William R. McKenzie, 11 E. Chase St., Baltimore.
Secretary: Dr. James J. Chisolm, Medical Arts Bldg., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

Buffalo Oto-Laryngological Society

President: Dr. John F. Healey, 925 Delaware Ave., Buffalo.
Secretary-Treasurer: Dr. Herrmann E. Bozer, 468 Delaware Ave., Buffalo.
Place: Buffalo Club. Time: Second Tuesday of each month from September to May, inclusive.

Chicago Laryngological and Otological Society

President: Dr. George J. Dennis, 25 E. Washnigton St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Cincinnati Oto-Laryngological Society

President: Dr. Edward D. King, 707 Race St., Cincinnati.
President-Elect: Dr. M. F. McCarthy, Union Central Bldg., Cincinnati.
Secretary-Treasurer: Dr. Samuel Seltz, Provident Bank Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. William V. Mullin, 9204 Euclid Ave., Cleveland.
Secretary: Dr. H. C. Rosenberger, 2064 E. 9th St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. Ralph Butler, 2007 Chestnut St., Philadelphia.
Clerk: Dr. Karl M. Houser, 1826 Pine St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Columbus Ophthalmological and Otolaryngological Society

Chairman: Dr. Ivor Clark, 188 E. State St., Columbus, Ohio.
Secretary-Treasurer: Dr. Francis W. Thomas, 327 E. State St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. L. M. Sellers, 717 Pacific Ave., Dallas, Texas.
Secretary: Dr. W. Mood Knowles, 1717 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6:30 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Oto-Laryngological Society

President: Dr. Raymond Goux, 1551 Woodward Ave., Detroit.
Secretary-Treasurer: Dr. R. Lee Laird, 513 David Whitney Bldg., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. J. J. Richardson, 606 Penn St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, 1304 Medical Arts Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. Claude C. Cody, 1306 Walker Ave., Houston, Texas.
Secretary: Dr. J. M. Robinson, Eye, Ear, Nose and Throat Hospital, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. B. J. Larkin, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
Place: Indianapolis Athletic Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. W. E. Keith, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. O. S. Gilliland, Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. R. R. Montgomery, 102 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. Russell T. Uhls, 823 Security Bldg., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. Eugene R. Lewis, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of of each month, May to November, inclusive.

Medical Society of the County of Kings, Section on Otolaryngology

Chairman: Dr. John M. Auwerda, 878 President St., Brooklyn.
Secretary-Treasurer: Dr. Charles R. Weeth, 37 Remsen St., Brooklyn.
Place: Library Bldg., County Society, 1313 Bedford St., Brooklyn.
Time: 9 p. m., second Wednesday of January, March, May and November.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. James A. Flynn, 1511 Rhode Island Ave., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St., N. W.: Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Hilliard Wood, 700 Church St., Nashville.
Secretary-Treasurer: Dr. H. C. Smith, Medical Bldg., Nashville.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otological Society

President: Dr. W. R. Buffington, 211 Camp St., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. John M. Loré, 240 West End Ave., New York.
Secretary: Dr. Robert E. Buckley, 2 E. 103d St., New York.
Place: 103d St., and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. W. P. Haney, 107 S. 17th St., Omaha.
Secretary-Treasurer: Dr. W. A. Cassidy, 1620 Medical Arts Bldg., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Arthur J. Wagers, 1429 Spruce St., Philadelphia.
Secretary: Dr. Herman B. Cohen, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. James Homer McCready, 121 University Place, Pittsburgh.
Secretary-Treasurer: Dr. Roy C. Cooper, 510 S. Aiken Ave., Pittsburgh.

Richmond Ophthalmological and Oto-Laryngological Society

President: Dr. Emanuel U. Wallerstein, Professional Bldg., Richmond, Va.
Secretary: Dr. William R. Weisiger, Medical Arts Bldg., Richmond, Va.
Place: Westmoreland Club. Time: 6 p. m., second Monday of each month from October to May.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. Clyde Heatly, 11 N. Goodman St., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 S. Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. Arthur W. Proetz, 3720 Washington Blvd., St. Louis.
Secretary: Dr. B. J. McMahon, 813 Missouri Bldg., St. Louis.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. Scott Applewhite, 706 Medical Arts Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. E. D. Dumas, 425 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

San Francisco County Medical Society, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Wilber F. Swett, 490 Post St., San Francisco.
Secretary: Dr. Robert Carson Martin, 384 Post St., San Francisco.
Place: Society's Building, 2180 Washington St., San Francisco. Time: Third Tuesday of every month except May, June, July and December.

Shreveport Eye, Ear, Nose and Throat Society

President: Dr. Claude L. La Rue, Highland Clinic, Shreveport, La.
Secretary-Treasurer: Dr. W. L. Atkins, 505 Medical Arts Bldg., Shreveport, La.
Place: 1240 Texas Ave. Time: 7:30 p. m., first Monday of each month from October to June.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. Paul A. Remington, Old National Bank Bldg., Spokane, Wash.
Secretary: Dr. Louis A. Parsell, Paulsen Medical and Dental Bldg., Spokane, Wash.
Place: Paulsen Medical and Dental Library. Time: 8 p. m., fourth Tuesday of each month except June, July and August.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. M. G. Brown, 713 E. Genesee St., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

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